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A CONSPECTUS OF MEXICAN, WEST INDIAN, CENTRAL  
AND SOUTH AMERICAN SPECIES AND VARIETIES  
OF SALIX

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In March 1917, at the request of Professor SARGENT, director of the Arnold Arboretum, I commenced a study of the American willows. A monograph of the genus *Salix* as far as it is represented in America<sup>1</sup> is certainly badly needed, but the attempt to investigate thoroughly the numerous species and forms described since ANDERSSON wrote his review in 1868 will prove a difficult task. It is not without a great deal of hesitation, therefore, that I have undertaken it, and I venture to ask the assistance of every one interested in the study of willows. I have already made a rather extensive investigation of the forms belonging to the PLEIANDRAE group (sect. NIGRAE, TRIANDRAE, PENTANDRAE subsect. LUCIDAE, and BONPLANDIANAE) and to sect. LONGIFOLIAE. At present I am occupied with the species of the sect. ARTICAE,

<sup>1</sup> In regard to the willows of the Old World it may be mentioned that there is a good account of those of Central Europe by O. v. SEEMEN in ASCHERSON and GRAEBENER, Syn. Mitteleurop. Fl. 4:54-350. 1908-9. Of the species of Eastern Asia and of the Himalayas I have given an enumeration in SARGENT, Pl. Wilson. 3:40-179. 1916. The willows of Central and Western Asia and those of Northern Europe and Northern Asia are very imperfectly known. I believe, however, that Rev. S. J. ENANDER, Lillherrdal, Sweden, the foremost living salicologist, is preparing a monograph of the whole genus.

RETUSAE, and RETICULATAE. I shall not deal with the forms of sect. CORDATAE because C. R. BALL, the well known salicologist at Washington, D.C., has already undertaken a monograph of this special group. Should anyone else be interested in a special study of any other section or group of the North American willows I should be very glad to hear from him.

In this article I intend to discuss the willows known from Mexico, Central America, and South America. There are among them many forms which, in my opinion, need a careful study in the field, and which are more or less closely related to forms from the southern parts of the United States. So far as I know, there has never been an attempt to give a critical review of these willows, but it seems to me impossible to determine any Mexican willow without having tried to interpret properly the species already described from that region.

I wish to express my thanks to the gentlemen in charge of the following herbaria for the opportunity to study the material contained in the different collections: Herbarium of the Arnold Arboretum, Gray Herbarium, Herbarium of the Missouri Botanical Garden, Herbarium of the New York Botanical Garden, and the United States National Herbarium at Washington.

The last enumeration of the Mexican willows was given by W. B. HEMSLEY (Botany, Biol. Central. Amer. 3:179-180. 1883), but there is no critical examination of them. Since then several new species have been described by O. v. SEEMEN and by W. W. ROWLEE, which partly, as will be shown in the following notes, are founded on a wrong interpretation of already existing species. Unfortunately, the types of most of those species are in European herbaria, and I have not been able to examine them, especially the types of the species established by MARTENS and GALEOTTI mostly on sterile branches. In consequence of this lack of important material I am not sure that my interpretation is correct in every case. Not only a careful study of the type specimens but also a more careful investigation of most of the species in the field is needed, and it is indeed the main purpose of this paper to draw the attention of all interested in the flora of Mexico and South America to what is still unknown of the willows of those countries.

## Clavis specierum

Stamina 3 vel plura

Folia adulta ramulorum sterilium surculorumque utrinque concoloria, viridia, linearia, lineari-lanceolata vel anguste lanceolata (rarius in surculis late lanceolata), utraque pagina stomatibus pl. m. aequinumerosis instructa

Ramuli annotini biennesque pl. m. rubescentes vel purpurascens; ovaria pedicellique glabri

Fructus perfecte maturi ovoidei, ovoideo-oblongi vel elliptici, apice vix vel tantum breviter attenuati, pedicello brevi iis plerumque 4-5plo brevior glandulam circ. 2-3plo superante suffulti; folia linearia vel lineari-lanceolata (rarius in surculis *S. Humboldtiana* var. *Martiana* late lanceolata), stipulae intus (an semper?) eglandulosae

1. *S. Humboldtiana*

Fructus perfecte maturi ovoideo-lanceolati, apice satis attenuati, pedicello satis variabili glandulam 2-5plo superante suffulti; folia lineari-lanceolata ad late lanceolata; stipulae intus pl. m. glanduliferae

2. *S. nigra*, var. *Lindheimerii*

Ramuli annotini biennesque pl. m. distincte flavescens vel flavo-cinerei; ovaria fructusque vel pedicelli tantum saepe pilosi; fructus ovoideo-vel anguste elliptico-lanceolati, apice pl. m. attenuati, plerumque satis longe pedicellati. . . . . 3. *S. Gooddingii*

Folia adulta ramulorum sterilium surculorumque subtus discoloria, glaucescentia

Ramuli annotini biennesque flavescens vel flavi; folia superne stomatibus numerosis instructa; petioli satis tenues et longi, quam lamina vix ultra 6plo breviores. . . . . 4. *S. amygdaloides* var. *Wrightii*

Ramuli annotini biennesque rubescentes vel purpurascens vel tomentelli; folia superne nunquam stomatifera

Fructus satis parvi et crassi, breviter ovoideo-conici, apice vix vel paullo attenuati, 4-5 mm. longi, pedicello satis crasso iis 4-5plo brevior excluso, vel pedicelli (basisque fructuum) pilosi

Ramuli annotini dense tomentosi; folia initio subtus dense villosotomentosula; petioli breves, vix ad 8 mm. longi; amenta mascula parva, tenuia, vix ad 3:0.8 cm. magna; fructus conferti circ. 4 mm. longi, basi pedicelloque pilosi . . . . . 5. *S. jaliscana*

Ramuli annotini glabri (hornotini tantum interdum pilosi); folia subtus semper glabra vel cito glabrescentia vel petioli foliorum majorum ultra 10 mm. longi; amenta saepissime serotina, in axillis foliorum adultorum apparentia, vel coetanea, mascula plerumque 4-6 cm. longa; fructus circ. 5 mm. longi, pedicello 4-6plo brevior excluso, glabri. . . . . 6. *S. Bonplandiana*

Fructus 5-9 mm. longi, apice subito vel sensim attenuati vel pedicello gracili tantum duplo brevior instructi

Stipulae in facie intus pl. m. glanduliferae, parvae vel nullae; folia matura superne vivide viridia, nitidula, margine saepissime satis indistincte et adpresse denticulata; fructus vix ultra 6 mm. longi, pedicello subduplo ad 3plo brevioribus excluso.....7. *S. laevigata*

Stipulae in facie intus tantum pl. m. pilosae vel glabrae, saepe (saltem in surculis) satis magnae; folia matura superne pl. m. sed obscure viridia, margine saepissime argutius glanduloso-serrato-denticulata; fructus 6-10 mm. longi, pedicello plerumque subduplo vel duplo brevioribus excluso.....8. *S. longipes*

#### Stamina tantum 2

Folia minima vel parva, pl. m. linearia vel lanceolata, utrinque aequaliter stomatifera, vel flores masculi semper glandulis 2 (ventrali dorsalique<sup>2</sup>) instructi, vel amenta tardiva, ramulos satis longos foliatis terminantia anguste linearia

Amenta brevia, mascula 5-13 mm. longa et circ. 8 mm. crassa, feminea satis pauciflora, fructifera haud ultra 2:1.2 cm. magna; antherae minimae, globosae vel breviter ellipticae, haud vel paullo longiores quam latae; stigmatum lobi lineares vel lineari-lanceolati.....9. *S. taxifolia*

Amenta longiora vel antherae ellipticae, circ. 1.5plo ad 2plo longiores quam latae vel stigmatum lobi breves oblongi

Flores masculini glandulis 2 instructi; ovaria glabra vel pl. m. pilosa, pilis haud micantibus.....10. *S. exigua* var.

Flores masculini glandula tantum ventrali instructi; ovaria densissime sericeo-villosa, pilis micantibus...11. *S. longifolia* var. *angustissima*

Folia majora vel latiora et nunquam superne stomatifera (si folia sunt parva glandula dorsalis in floribus masculis deest et ovaria longe pedicellata sunt)

Amenta in axillis foliorum adultorum apparentia, vix ultra 2 cm. longa, vel flores masculi (in *S. Schaffnerii* ignoti) etiam glandula dorsali parva praediti; stigmata parva; ovaria pedicellique glabri vel sparse pilosi

Ramuli hornotini annotinique tomentosi; folia subtus (saltem in costa) pl. m. tomentella

Gemmae foliiferae apice pl. m. rostratae, ad 8 mm. longae, glabrae, vel apice sparse pilosae; pedicelli ovariorum glandula 2-2.5plo longiores, bracteam haud superantes.....12. *S. Hartwegii*

Gemmae foliiferae tantum acutae, vix ultra 6 mm. longae, pl. m. villosa-tomentellae; pedicelli ovariorum graciles, glandula 4-5plo longiores, bracteam pl. m. superantes.....14. *S. Schaffnerii*

Ramuli semper glabri; folia glabra.....13. *S. mexicana*

Amenta praecocia vel coetanea; flores masculi tantum glandula ventrali instructi

Inflorescentiae satis magnae ultra 2.5 cm. longae; folia etiam mediocra ultra 2.5 cm. longa.

<sup>2</sup> With regard to the nomenclature of these glands see my note in SARGENT, Pl. Wils. 3:94. 1916.

- Ovaria glabra, tantum pedicelli interdum pilosi; stigmata brevia; filamenta glabra, libera vel  $\frac{1}{5}$ — $\frac{1}{3}$  coalita
- Folia lanceolata, oblanceolata vel anguste elliptica, saepissime ultra 3plo longiora quam lata; amenta mascula satis anguste cylindrica, vix plus quam 12 mm. crassa; filamenta basi pl. m. coalita; stigmata minima, stylis pluriplo breviora; bracteae pl. m. obovatae, apice valde obtusae vel truncatae. . . . . 15. *S. lasiolepis*
- Folia elliptica vel late elliptico-lanceolata, vix ultra 3plo longiora quam lata; amenta mascula crasse cylindrica, 1.5–2 cm. crassa; filamenta libera; bracteae oblongae, pl. m. acutae; stigmata mediocra stylis fere aequilonga. . . . . 16. *S. Rowleei*
- Ovaria (in *S. oxylepide* ignota) villosa, stigmata lanceolata; filamenta basi pl. m. pilosa, libera
- Bracteae anguste lanceolatae, apice distincte acutae vel breviter acuminatae. . . . . 17. *S. oxylepis*
- Bracteae oblongae, apice pl. m. obtusae vel subtruncatae, rarius acutiusculae. . . . . 18. *S. paradoxa*
- Inflorescentiae parvae, ut videtur vix ad 1 cm. longae; folia visa nondum matura tantum ad 1.8 cm. longa (vide etiam *S. Endlichii*, in nota post *S. canam*) . . . . . 19. *S. cana*

### Enumeratio sectionum specierumque

✓ Sect. I. NIGRAE Loudon, Arb. Frut. Brit. 3:1529. 1838; SCHNEIDER, Ill. Handb. Laubh. 1:32. 1904.—Sect. AMYGDALINAE Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 129. 1909, quoad *S. nigra*.

The species belonging to this well distinguished section are *S. nigra* Muhl., *S. Humboldtiana* Willd., and *S. Gooddingii* Ball. ANDERSSON (K. Svenska Vet. Akad. Handl. 6:15. 1867; and DC. Prodr. 16<sup>2</sup>:199. 1868) refers *S. Humboldtiana* to his section AUSTRO-AMERICANAE vel HUMBOLDTIANAE, but he also includes *S. Bonplandiana* Kth., which certainly does not belong to the same group. *S. nigra* is included by ANDERSSON and other authors in sect. AMYGDALINAE (vel TRIANDRAE) together with *S. amygdaloides* And. In my opinion, *S. nigra* is much more closely related to *S. Humboldtiana* than to *S. amygdaloides* or any other species of sect. AMYGDALINAE. The species of sect. NIGRAE are exclusively American, and show no very close relationship to any other group of American willows or any section of those of the Old World. H. GÄRTNER (Vergl. Blatt Anatomie Gatt. Salix, Diss. Göttingen, 1907,

p. 22) apparently did not examine a true *nigra* because he does not mention the stomata in the upper surface of the leaf, but says "unterseits Stomaten und Wachsanflug." *S. nigra*, like *S. Humboldtiana*, possesses however "beiderseits Kutikularfalten und eine gleichgrosse Anzahl von Stomaten."

1. *S. HUMBOLDTIANA* Willd., Sp. Pl. 4:657. 1805; Kunth in Humb. and Bonpl., Nov. Gen. Pl. 2:18, pls. 99, 100. 1817; Syn. Pl. Aequin. 1:364. 1822; Gay, Hist. Chile Bot. 5:384. 1849; Leybold in Martius, Fl. Bras. 4<sup>1</sup>:227. pl. 71, 1855; de la Sagra, Fl. Cubana 3:232. 1853; Grisebach, Fl. Brit. W. Ind. Isl. 113. 1864; Philippi, Cat. Pl. Vasc. Chile, 267. 1881; Hieron., Pl. Diaph. Fl. Argent. 271. 1882; Fawcett, Prov. List Flow. Pl. Jamaica 37. 1893; Duss in Ann. Inst. Col. Marseille 3:107 (Fl. Phan. Antill. Franç.). 1897; Macloskie in Princeton Univ. Exp. Patag. 8<sup>1</sup>: Bot. 325 (Fl. Patag.) 1903-6; *S. magellanica* Poir. in Lam. Encycl. Suppl. 5:66. 1817; *S. falcata* Kunth in Humb. and Bonpl., Nov. Gen. Pl. 2:19. 1817, non Pursh; *S. Humboldtiana*, \*\**S. falcata* And. in K. Sv. Vet.-Akad. Handl. 6:17 (Mon. Salic.). 1867; *S. Humboldtiana*  $\beta$  *falcata* And. in DC. Prodr. 16<sup>2</sup>:199. 1868; *S. chilensis* Morong and Britton in Ann. N.Y. Acad. Sci. 7:231 (Enum. Pl. Morong Paraguay). 1892, non Molina;<sup>3</sup> Seemen in Urban Symb. Antill. (Fl. Ind. Occ.) 4:193. 1905; Fawcett and Rendle, Fl. Jamaica 3:30. 1914.

TYPE LOCALITY.—"Peru, prope Loxam" (leg. *Humboldt* and *Bonpland*); this is Loja in southern Ecuador.

RANGE.—According to MORONG this willow "grows from the Amazon to Patagonia on both sides of the Andes." It is difficult to say where it is really spontaneous, because it has been widely distributed by cultivation. Although

<sup>3</sup> *S. chilensis* Molina, SAGGIO Storia Nat. Chili 169. 1782, is in my opinion an obscure plant. The author's quotation runs: "*Salix* fol. integerrimis glabris lanceolatis acuminatis," and in the Italian text he says: "Il Salce, *Salix chilensis* . . . non differisce dall' Europeo, che nelle foglie, le quali sono intiere, sottili, e di un verde giahligno: questo albero produce una gran quantita di manna tutti gli anni. . . ." Neither has *S. Humboldtiana* entire leaves, nor can I find any record of a willow producing "manna." The name *S. chilensis* seems to be accepted for our willow only because there is no other willow in Chile except the cultivated *S. babylonica* L. which had not yet been introduced at MOLINA'S time. I strongly suspect that MOLINA'S plant is no *Salix* at all. It is not mentioned by REICHE in his Productos Vegetales de Chile, 1901, nor in ENGLER and DRUDE, Veget. der Erde VIII (Grundzüge Pflanzenwelt Chile). 1907.

I have seen specimens from Argentine, Chile, Uruguay, Paraguay, Bolivia, Peru, Colombia, and southern Brazil I do not have a correct understanding of the wild habitat of this species, most of the material before me coming, apparently, from cultivated plants. I suppose *S. Humboldtiana* inhabits river valleys in the cold and temperate region from the Straits of Magellan to southern Brazil in the east and Ecuador in the west. Farther north, in Colombia and on the West Indian Islands, it seems to be only planted, but may occur sometimes escaped from cultivation. In Central America and in Mexico it is represented by var. *stipulacea*.

SPECIMENS EXAMINED.—I have not seen the type, which seems to be preserved in WILLDENOW'S herbarium at Berlin, and I do not deem it necessary to enumerate here all the specimens I have seen because, as I have already said, most of them seem to be taken from cultivated plants.<sup>4</sup>

*S. Humboldtiana* is apparently a well marked species, and I deal with its relationship to *S. nigra* under var. *stipulacea*.

1b. *S. HUMBOLDTIANA*, var. **stipulacea** Schn., comb. nov.—*S. Houstoniana* Pursh, Fl. Am. Sept. 2:614. 1814. quoad specim. Houstonianum ex Herb. Banks; *S. stipulacea* Mart. and Galeotti in Bull. Ac. R. Brux. 10<sup>1</sup>:343 (Enum. Pl. Gal. Mex. 3) 1843; *S. Humboldtiana* \*\*\**S. oxyphylla* And. in K. Sv. Vet.-Akad. Handl. 6:17 (Mon. Salic.). 1867, pro. parte; *S. Humboldtiana* γ *oxyphylla* And. in DC. Prodr. 16<sup>2</sup>:199. 1868, pro parte; Bebb apud Smith Enum. Pl. Guat. part 2:71. 1891; part 3:76. 1893; *S. Humboldtiana* Mart. and Gal. in Bull. l. c. non Willd.; Hemsl. in Biol. Centr. Am. Bot. 3:179. 1883, pro parte.

A typo praecipue recedit foliis non distincte linearibus sed pl. m. lineari-lanceolatis fere a basi ad apicem sensim attenuatis apice plerisque distinctius caudato-acuminatis et basi magis cuneato-attenuatis, stipulis saltem ramulorum validorum distinctius evolutis.

TYPE LOCALITY.—State Hidalgo, "au bord du Rio Grande de Mexitlan [Metztitlan] près du district de Real del Monte" (coll. *H. Galeotti*, no. 75, ex Martens and Galeotti).

RANGE.—This variety seems to reach its most northern point in Hidalgo, from where its range extends southward into Guatemala, Salvador, and Costa Rica, but I am not sure whether it is really spontaneous in the last two countries. It is probably also planted, together with the type, on the West Indian Islands.

<sup>4</sup> An enumeration of all the specimens I have examined will be given in the final publication of my studies on American willows.

SPECIMENS EXAMINED.—I have seen what I believe may be specimens from wild plants from the following states of Mexico: Hidalgo, Colima, Vera Cruz, Oaxaca, Tabasco, and Chiapas, and from the following Departments of Guatemala: Alta Verapaz, Izabal, Jalapa, Guatemala, Sololá, Amatitlan, and Zacatepequez.

The var. *stipulacea* is certainly very closely related to the typical *S. Humboldtiana*, but from the material before me I judge it to be a good geographical form which in some respect approaches *S. nigra*. The main difference between *S. Humboldtiana* and *S. nigra*, in my opinion, is the shape of the mature fruits which are ovoid-elliptical with a rather blunt apex in the first; while those of *S. nigra* and its varieties are more distinctly elongated and pointed at the apex, with mostly comparatively longer pedicels. Regarding the shape of the fruit, var. *stipulacea* has to be referred to *S. Humboldtiana*; the leaves, however, resemble more those of *S. nigra* var. *Lindheimerii*. There are indeed several forms in Hidalgo (namely, the specimens of C. S. PRINGLE from Tula, March 23, 1906) that need further observation in the field. They possess the glandular stipules of var. *Lindheimerii* and the fruits of var. *stipulacea*. In the state of Hidalgo the most southern forms of *S. nigra* seem to meet the most northern ones of *S. Humboldtiana*.

As to the nomenclature of the variety, the following may be said. Most of the authors used to refer it to *S. oxyphylla* Kth. in Humb. and Bonpl., Nov. Gen. Pl. 2:19. 1817; Syn. Pl. Aequ. 1:365. 1822, the type of which was collected by *Humboldt* and *Bonpland* "prope Chilpanzingo" (Chilpanzingo, in the state of Guerrero). Not having been able to compare a type specimen, nor having seen any specimen from near the type locality, I refrain from using the name *oxyphylla*, because in the description KUNTH makes the following statement: "semina minuta, oblonga, lanata; stipite dimidiam vix lineam longo, pubescente." The whole seed being hardly half a line long and having no "stipes," the statement seems to indicate a pubescent pedicel of the ovary, but I have not met with such a form. I regard *S. oxyphylla* as an uncertain name, therefore, and I accept the name *stipulacea* given by MARTENS and GALEOTTI to a form that differs from *S. Humboldtiana* by its persistent stipules and its more sharply acuminate leaves.

1c. *S. HUMBOLDTIANA*, var. *MARTIANA* And. in DC. Prodr. 16<sup>2</sup>:199. 1868.—*S. Martiana* Leybold in Martius, Fl. Bras. 4<sup>1</sup>:228. pl. 72. 1855; in Walp. Ann. Bot. 5:757. 1858; Huber in Bull. Herb. Boiss. II. 6:253. 1906, in adnot.; *S. Humboldtiana* \**S. Martiana* And. in K. Sv. Vet.-Akad. Handl. 6:18 (Mon. Salic.). 1867.

Varietas porro observanda a typo praecipue differre videtur floribus femineis glandula etiam dorsali (an semper?) instructis, fructibus ellipticis utrinque pl. m. obtusis paullo majoribus.



TYPE LOCALITY.—“In omni ripa et in insulis sabulosis flum. Amazonum a Gurupà (prov. Para in Brasilia) at Peruviam usque frequens.”

RANGE.—This variety seems to be confined to the territories of the Amazon and Solimoes River in Brazil, and probably in the adjacent part of Colombia.

SPECIMENS EXAMINED.—Brazil; Prov. Para, “in vicinibus Santarem,” July 1850, *R. S. Spruce* (fr.; G.);<sup>5</sup> Lower Amazons, Prainha, marshy beach, November 18, 1873, *I. W. H. Traill* (no. 717, fr.; G.)—Colombia (?), without locality (Herb. Lehmannianum, B.T. 1261, f., fr.).

The material before me is much too scanty to judge the value of this variety. The main characters by which it may be separated from typical *S. Humboldtiana* seem to be the presence of a dorsal gland in the pistillate flowers and the more elliptical shape of the somewhat larger capsules. In SPRUCE'S specimen two of the otherwise normal leaves are broadly lanceolate, the larger being about 21 mm. wide. LEYBOLD gives as another distinguishing character the hairy pedicels which, however, are glabrous on the specimens before me. This form needs further investigation.

2. *S. NIGRA* Marsh., var. *Lindheimerii* Schn., nov. var.—*S. Humboldtiana*,  $\gamma$  *oxyphylla* And. in DC., l. c. 199, quoad specim. *Berlandierii* no. 2317, 3026; *S. nigra* Mackensen, Trees Shrubs San Antonio 14. 1909, non Marsh.; *S. Wrightii* Sargent, Trees and Shrubs 2:215. 1913, quoad specimina texana, non And.; *S. Humboldtiana* Blankinship in Rep. Miss. Bot. Gard. 18:194. 1907, non Willd.

Arbor ad 15–20 m. alta, trunco ad 0.75 m. crasso, cortice cinereo-brunnescente rugoso; ramuli novelli pl. m. pilosi vel villosuli, cito glabrescentes vel glabri, hornotini olivacei vel flavo-brunnei, annotini brunnescentes, dein cinereo-brunnei vel cinereo-fusci, satis graciles tenuesque, teretiusculi; gemmae ovatae, acutiusculae, petiolis subtriplo breviores, apice divaricatae. Folia adulta satis firma, linearia, lineari-lanceolata vel majora anguste lanceolata, ramulorum principalium steriliumque<sup>6</sup> (inferioribus

<sup>5</sup> I am using the following abbreviations: G., Gray Herbarium; M., Herbarium Missouri Botanical Garden; N., Herbarium New York Botanical Garden; W., U.S. Nat. Herbarium, Washington, D.C. If there is no indication of a herbarium the specimens are in A., the herbarium of the Arnold Arboretum (and mostly also in the other herbaria); also, m., male specimen; f., female specimen in anthesis; fr., fruiting specimen (im. fr. means with immature fruits); st., sterile specimen.

<sup>6</sup> I distinguish 3 different kinds of leaves: (1) those of the ends of main and sterile branchlets and of vigorous shoots (offshoots and suckers), which usually represent the typical mature leaves toward the end of the season; (2) those of the lower parts of these parts, representing the leaves of the first season's growth which are

exceptis) basi sensim in petiolum attenuata, ab infra medium ad apicem sensim acuminata, apice satis longe caudata, saepe falcata, 7:0.3 vel 8:0.6 ad 12:0.7 vel 15:1.2 cm. magna, inferiora saepe lineari-elliptica, utrinque obtusiora vel obtusa, ramulorum fertilium (pedunculorum) variabilia, saepe elliptico-linearia vel anguste elliptica, utrinque acuta vel obtusiora, 2:0.3 ad 6-7:0.7-0.9 cm. magna, superne tantum valde initio sparse puberula et citissime glabrescentia, vivide viridia, ut in *Humboldtiana* reticulata et nervo intra-marginali percursa, subtus concoloria, initio ut superne vel saepe paullo magis pilosa, dein glaberrima, eodem modo reticulata, margine satis dense aequaliter glanduloso-serrato-denticulata vel in foliis inferioribus ramulorum fertilium indistinctius dentata vel interdum subintegerrima. Petioli quam in *S. nigra* pl. m. longiores, latitudinem maximam laminae plerique superantes, 2-10 mm. longi. Stipulae satis rariter distincte evolutae, iis formae typicae similes sed intus in facie pl. m. glanduliferae, vix ultra 8 mm. longae. Amenta fere ut in forma typica sed saepissime magis laxiflora, mascula ad 7:0.8 cm. magna; stamina 3-7, filamentis ad medium vel paullo ultra dense villosis; bractee ovatae vel ovato-oblongae, pl. m. acutae, rarius obtusae, utrinque villosulae vel extus ultra medium ad apicem glabrescentes; glandulae 2, dorsalis pl. m. 3-partita (digitata); amenta feminea fructifera 4-7:1.3 cm. magna (pedunculis foliatis interdum ad 4 cm. longis exclusis), pl. m. laxiflora; bractee ovato-oblongae, pl. m. acutae, interdum ad apicem parce denticulatae, ut in floribus masculis villosae; ovaria stigmataque ut in *S. nigra* typica; glandula 1, ventralis, pl. m. ovata-rectangularis, apice truncata, pedicello juvenili duplo brevior; fructus maturi (5-)6-7 mm.

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mostly of a different shape, and often more resemble those of the fertile branchlets; and (3) those of the fertile branchlets, that is, of the peduncles or the branchlets terminated by the catkins. It seems to me very helpful to keep apart those 3 different kinds of leaves, of which as a rule only one or two are represented in a specimen. Therefore, every collector of willows should try to get, at different times of the year, if possible from the same plant and of both sexes, the following parts: (1) branchlets with young flowers; (2) branchlets with ripe fruits collected when the first capsules begin to open; (3) mature leaves collected toward the end of the season (end of August to end of September, except in subtropical climates); (4) parts of offshoots with mature and young leaves; (5) leafless branchlets in winter with good buds, and pieces of bark.

longi, iis formae typicae similes sed basi pl. m. subito attenuati, pedicellis satis tenuibus 2-3plo brevioribus glandulam siccam 4-6plo superantibus suffulti.

TYPE LOCALITY.—Texas, Comal County, on the Guadalupe River (leg. *Lindheimer*, no. 415).

RANGE.—Eastern and southeastern Texas (perhaps also in southern Oklahoma), from about 34° N. lat. and between 100 and 95° W. long. southward into Mexico to southeastern Coahuila, Nuevo Leon, and to Tamaulipas (and probably also Hidalgo).

SPECIMENS EXAMINED.—Texas: Comal County, New Braunfels, on the Guadalupe and other rivers, 1850, *F. Lindheimer* (no. 415, m., f., fr., type!; G., M.; in the Gray herbarium named by ANDERSSON himself *S. nigra* var. *angustifolia*; it is the same as no. 1189 distributed by the Mo. Bot. Gard. as *S. Humboldtiana*).—Mexico: State of Tamaulipas: Matamoros, March 1836, *J. J. Berlandier* (no. 3026, fr.; sub nomine inedit. “*S. viridis*”; G., M.); without exact locality (perhaps from Texas), *J. J. Berlandier* (no. 854, st.; M.; no. 887, fr.; G., M.; no. 2274, st.; G., M.; no. 2317, fr.; G., M.); vicinity of Victoria, alt. about 320 m., February 1—April 9, 1907, *E. Palmer* (no. 134, m.; M., W.).—State of Nuevo Leon: Monterey, May 1891, *C. K. Dodge* (m., fr.; W.; forma porro observanda); same locality, common, March 19-20, 1900, *C. S. Sargent* (m., f.; “large tree”); same locality, March 18-19, 1900, *W. M. Canby* (nos. 231, f., 232, m.; G., W.); same locality, March 18, 1900, *W. Trelease* (no. 131, f.; M.).—State of Coahuila: Ciudad Porfirio Diaz, April 8, 1900, *W. Trelease* (no. 133; M.; fructibus juvenilibus ad *S. Humboldtianam* spectans); Saltillo, April 15-30, 1898, *E. Palmer* (no. 27, m.; “tree of 30 ft. or more high, rather rough bark, not seen over 1 ft. in diam., about watercourses and cultivated places, indicating artificial planting”); mts. 6 miles east of Saltillo, April 1888, *E. Palmer* (no. 1286, m.; G., W.); Pueblo near Saltillo, March 18, 1847, *J. Gregg* (no. 296, m.; M.); San Bernardo or “Green Spring,” April 8, 1847, *J. Gregg* (no. 479, m., fr.; M.).

This willow, which has hitherto been regarded either as *S. nigra* or *S. Humboldtiana*, seems to me to represent the most southern form of *S. nigra*. It is not always easy to separate it from typical *nigra* from northern Texas, but the leaves are usually narrower or at least more attenuated at the base, with a comparatively much longer petiole. The young branchlets and the petioles are glabrous or become so very soon, while those of *S. nigra* and its southeastern var. *altissima* Sarg. are, for some time at least, more or less distinctly puberulous or villose. Moreover, the stipules of var. *Lindheimerii* bear always some

<sup>7</sup> There is a specimen collected by C. G. PRINGLE, Jimulco, by streams, alt. 1300 m., October 10, 1905 (no. 10086½, fr.; G.; “a medium sized tree”), bearing only short dense aments (1-2.5:1 cm.), with small, linear-lanceolate, almost entire leaves (about 2-3:0.4-0.5 cm.) on the short peduncles which, I believe, has to be referred to var. *Lindheimerii*.

minute yellowish glands upon the inner surface, which are absent in the typical black willow and var. *altissima*. The fruits of var. *Lindheimerii* are somewhat larger (6–7 mm. long) than those of the typical form (4–5 mm.). On the other hand, the Mexican specimens are often very similar to those of *S. Humboldtiana*, var. *stipulacea*; from this var. *Lindheimerii* seems to be best distinguished by its looser fruiting catkins, its more elongated fruits with longer and thinner pedicels, its leaves being more distinctly attenuated at the base, and by its comparatively longer petioles.

There are the following specimens from western Mexico which may represent a distinct form of var. *Lindheimerii* or a new variety of *S. nigra*. From a geographical point of view one might expect those plants to be a form of *S. Gooddingii*, but the color of the older branchlets, although being not quite so reddish brown as in var. *Lindheimerii*, is much more like it than *S. Gooddingii*. I do not dare to propose a new variety, but I want to draw the attention of collectors to it in the hope that they may be able to procure good flowering material, ripe fruits, and mature leaves.

Mexico: State of Sinaloa, vicinity of Guadalupe, April 18, 1910, *J. N. Rose*, *P. C. Standley*, and *P. G. Russell* (no. 14780, st.; W.; folia lineari-lanceolata iis var. *Lindheimerii* simillima, ad 13 cm. longa et 9 mm. lata, basi valde acuta, petiolis gracilibus fere ad 1 cm. longis); vicinity of Villa Union, moist field, April 2, 1910, same coll. (no. 13955, m., N., W.; folia ut in praecedente, amenta parva, vix 2.5:0.6 cm. magna; bracteae versus apicem amenti acuminatae, basim versus obtusiores; pedunculi vix 1 cm. longi, folia plura linearia ad 3 cm. longa gerentes); vicinity of Culiacan, April 21, 1910, same coll. (no. 14893, f., st.; N., W.; folia maxima ad 13:1.4 cm. magna, petiolis ad 15 mm. longis; flores ut in var. *Lindheimerii*; fructus immaturi circ. 5 mm. longi pedicello duplo brevior).—Terr. Tepic, Santiago, February 1895, *F. H. Lamb* (no. 581, f.; G., M., N.; a var. *Lindheimerii* praecipue differt bracteis florum juvenilium acuminatis et pubescentia distinctiore ramulorum novellorum; amenta valde laxiflora, ad 8 cm. longa, fructibus nondum maturis); vicinity of Acaponeta, April 11, 1910, *Rose*, *Standley*, and *Russell* (no. 14362, st.; N., W.; ramuli hornotini flavescens, ceterum ut in var. *Lindheimerii*).

3. *S. GOODDINGII* Ball in BOT. GAZ. 40:376, pl. 12, figs. 1, 2. 1905.—*S. nigra* Bebb in Watson, Bot. Calif. 2:83. 1879, non Marsh.; Jepson, Fl. Cal. 2:339. 1909; Parish, Cat. Pl. Salton Sink 3. 1913 (reprinted from "The Salton Sink," Publ. no. 93, Carnegie Inst. Wash.); Wooton and Standley in Contrib. U.S. Nat. Herb. 19:161 (Fl. N.Mex.). 1915; *S. nigra*, var. *vallicola* Dudley apud Abrams, Fl. Los Angeles 100. 1904; Suppl. Ed. 100. 1911; *S. vallicola* Britt., N.Am. Trees 184. fig. 141. 1908; *S. Wrightii* Woot. and Standl. in Contrib. l. c. 160. 1915, non And.

TYPE LOCALITY.—Southeastern Nevada, Clark County, Muddy Creek (coll. *Goodding*, no. 689, f.; forma satis abnormalis ab insectis infecta).

RANGE.—California, southeastern Nevada, Arizona, southwestern New Mexico (probably also east of the Rio Grande and even in southern Colorado), and northern Mexico (Chihuahua, Sonora, northern Sinaloa, northern Lower California).

SPECIMENS EXAMINED (from Mexico).—Lower California: Gardner's Laguna, April 21, 1894, *L. Schoenfeldt* (no. 2895, st.; W.); Seven Wells, on the Salton River, April 8, 1894, *E. A. Mearns* (no. 2869, m.); along Hardy River, April 3, 1905, *D. McDougal* (no. 100, f.; N.; "small tree").—State of Sonora: Sonora shore of Colorado River near International Boundary, March 27, 1905, *D. McDougal* (no. 90, m.; N.; "tree 30-40 ft."); Colonia Diaz, May 29, 1894, *E. A. Mearns* (no. 2840, m.; G., M., N., W.); La Chumata, alt. 1330 m., May 29, 1905, *W. W. Brown* (st.); vicinity of Magdalena, April 25, 1910, *J. N. Rose*, *P. C. Standley*, and *P. G. Russell* (no. 15113, fr.; W.); vicinity of Hermosillo, bed of Rio de Sonora, March 5, 1910, same coll. (no. 12391, fr.; N., W.; "5 ft. or less"; forma porro observanda pedicellis fructuum subbrevioribus); along irrigating ditches, March 7, 1910, same coll. (no. 12501, m., f.; W.; forma porro observanda); vicinity of Navojoa, March 21, 1910, same coll. (no. 13156, fr.; N., W.; ut praecedens).—State of Chihuahua: along the Rio Grande near Ciudad Juarez, 1911, *E. Stearns* (fr.; N.; mixed with male *S. exigua*, var. *stenophylla*); vicinity of Chihuahua, alt. about 1300 m., April 8-27, 1908, *E. Palmer* (nos. 41, f., 42, m.; N.; forma porro observanda); Santa Eulalia Mts., April 1885 (3?), *Wilkinson* (m.; W.); Lake Palomas, Mimbres Valley, April 14, 1892, *E. A. Mearns* (no. 184, f.; W.; also no. 183 in 1892 without exact locality, fr.; N.).—State of Sinaloa, vicinity of San Blas, March 24, 1910, *Rose*, *Standley*, and *Russell* (no. 13415, f., fr.; N., W.).

C. R. BALL, in describing *S. Gooddingii* from rather poor female specimens, mistook it for a species of sect. LONGIFOLIAE. Later he recognized, as he has told me, the identity of his species with *S. nigra* var. *vallicola* Dudl. (*S. vallicola* Britt.). According to the international code the name *S. Gooddingii* has to be used if this willow is considered a distinct species. It certainly is a good species, and very different from the eastern *S. nigra*, which always has more or less reddish brown or purplish branchlets. Otherwise, the western species is closely related to *S. nigra*, and is clearly a member of the same section.

Sect. II. TRIANDRAE Dumortier in *Bijdr. Natuurk. Wetensch.* 1:58 (Verh. Gesl. Wilgen 17). 1825; Borrer in Hooker, *Brit. Fl.* 414. 1830; in Loud., *Arb. Frut. Brit.* 3:1496. 1838, excl. *S. lucida*.—Sect. AMYGDALINAE W. D. Koch, *Salic. Eur. Comment.* 17. 1828, pro parte; Andersson in *K. Sv. Vet.-Akad. Handl.* 6:19 (Mon. Salic.). 1867, pro parte; in DC. *Prodr.* 16<sup>2</sup>:200. 1868, pro parte; Ball in *Coult. and Nels., New Man. Rocky Mt. Bot.* 129. 1909, excl. *S. nigra*.

In my opinion, *S. amygdaloides* And. is the only American willow which belongs to this section. It seems to be more closely related to the European-Asiatic *S. amygdalina* L. than to *S. nigra* with which it is usually associated in the same section by authors.

4. *S. AMYGDALOIDES*, var. **Wrightii** Schn., comb. nov.—*S. Wrightii* And. in Oefvers. K. Vet.-Akad. Förh. 15:115 (Bidr. Känned. Nordam. Pilart.). 1858; in Proc. Amer. Acad. 4:55 (Sal. Bor.-Am. 9). 1858; in Walp., Ann. Bot. 5:745. 1858; *S. nigra* \*\*\**S. Wrightii* And. in K. Sv. Vet.-Handl. 6:22. 1867; *S. nigra* b. *latifolia*  $\gamma$  *brevifolia testacea* And., l. c. 21; *S. nigra*  $\delta$  *Wrightii* And. in DC. Prodr. 16<sup>2</sup>:201. 1868; Hemsl. in Biol. Centr. Am. Bot. 3:180. 1883, quoad Wright 1877<sup>8</sup>; Bebb in Bot. Gaz. 16:102. 1891; *S. testacea* And., in Prodr. l. c., pro synonym. *S. nigrae* formae 3.

TYPE LOCALITY.—Western Texas, El Paso County, or, according to WOOTON and STANDLEY, Mexico, state of Chihuahua, on the Upper Rio Grande or from Lake Santa Maria (coll. C. Wright no. 1877).

RANGE.—Western Texas near the border of Mexico and probably adjacent Mexico, northern New Mexico (and ? southern Colorado).

SPECIMENS EXAMINED.—Besides C. Wright's nos. 1876 and 1877, which may have been collected in Chihuahua in the places mentioned above, I have not seen any specimen from Mexico.

Judging by the material before me, *S. Wrightii* seems to be hardly more than a variety of *S. amygdaloides*, from which it differs chiefly in its more distinctly yellowish branchlets, its more lanceolate and more gradually acuminate leaves which always possess numerous stomata in the upper epidermis. It is certainly not a "mere forma monstrosa" as BEBB suggested in Gard. and For. 8:363. 1895; and as is stated even by BALL in Coult. and Nels., New Man. Rocky Mt. Bot. 129. 1909, who, however, regards it now as a good species. The type specimen, Wright no. 1877, shows short, dense, and indeed not quite normal fruiting aments, which when well developed measure up to 10 cm. in length. Wright no. 1876, the type of what ANDERSSON called *S. nigra latifolia brevifolia testacea*, a specimen with male and female flowers and very young leaves, has been erroneously regarded by some authors as being the same as *S. nigra longipes venulosa* And. The type of this form which I have not seen from Mexico is Wright no. 1879. It represents the southwestern variety of *S. longipes* Shuttl. (*S. occidentalis* Bosc apud Koch, non Walter) and has to be called *S. longipes*, var. **venulosa** (And.) Schn., n. comb.

<sup>8</sup> The second specimen mentioned by HEMSLEY, which had been collected by Jurgensen (no. 307) in the "Sierra San Pedro Nolasco" (? state of Oaxaca), does not belong to our variety, but I have not seen it.

Sect. III. BONPLANDIANAE Schn., sect. nov.—Sect. AMYGDALINAE And. in K. Sv. Vet.-Akad. Handl. 6:19 (Mon. Salic.). 1867, pro parte; in DC. Prodr. 16<sup>2</sup>:200. 1868, pro parte.—Arbores vel frutices alti. Folia mediocra vel satis magna, pleraque anguste vel late lanceolata vel elliptico-lanceolata, adulta crasse papyracea, superne non stomatifera. Amenta coetanea vel serotina, mascula brevi-pedunculata vel rarius sessilia, cylindrica, interdum satis longa, densi- vel sublaxiflora, floribus pleiandris, staminibus 3-7(-11), antheris pl. m. globosis, glandulis 2, saepe lobulatis vel partitis et pseudodiscum formantibus rarius distinctis dorsali interdum parva; amenta feminea pleraque longius pedicellata, fructifera saepe elongata, pleraque densiflora; ovaria longe (rarius breviter) pedicellata, glabra vel (saltem partim) pilosa; styli breves vel brevissimi, stigmatibus satis brevibus clausis vel emarginatis; glandula una ventralis, saepe lata, truncata et satis crassa, interdum basim pedicelli subamplectens.<sup>9</sup>

The species united by me in this section form a very distinct group of the American PLEIANDRAE. They are closely related among each other, but well separated from the other sections of the PLEIANDRAE either in America or in the Old World. In some respects they somewhat resemble the species of sect. TETRASPERMAE And. sensu SCHNEIDER in Sargent, Pl. Wilson 3:93. 1916, but I am far from assuming that there may be a close relationship between those two sections. A main difference between the species of sect. BONPLANDIANAE and most of the other American PLEIANDRAE is the complete absence of stomata in the upper surface of the

<sup>9</sup> With regard to these glands the following is to be said. In SARGENT, *Silva N. Am.* 9:120. 1896, we find the statement that *S. Bonplandiana* (var. *Toumeyii*) has a "cup-shaped disk," and that it is the only willow of the United States with a cuplike disk. Besides this, SARGENT says that this disk "is not represented in ANDERSSON'S figure" (Mon. Salic. pl. 1, fig. 14), but in ANDERSSON'S fig. 14, d the disk is well shown. Referring to the figure given in SARGENT (pl. 472), TOEPFFER (Österr. Bot. Zeit. 54:175. 1904) says that there is in *S. Bonplandiana* "ein vollkommen becherförmiger Torus, wie bei der Gattung *Populus*." This is, however, not the case. After having investigated the flowers of the specimens mentioned above, I find that there is only a large and broad ventral gland which sometimes almost entirely encircles the base of the pedicel, but mostly there is a distinct lack of a dorsal gland. The very same conditions may be observed in specimens of the typical *S. longipes* Shuttl. from Florida. The broad, half-embracing ventral gland is very rarely nearly cup-shaped and somewhat similar to the cuplike torus of *Populus*.

leaves. Probably all the other PLEIANDRAE possess such stomata, but sometimes they are so sparse that it is difficult to detect them.

5. *S. JALISCANA* Jones, Contrib. West. Bot. 12:77. 1908.— Ad descriptionem addenda et emendanda: Frutex ut videtur altus; truncus?; ramuli novelli dense griseo- vel subferrugineo-villosulo-tomentosi, annotini fuscescentes, laxius vel tantum partim tomentosuli, vetustiores fusco-cinerascentes, glabrescentes. Gemmae bene evolutae non visae, ut videtur glabrae. Folia matura perfecte evoluta a me non visa, semievoluta (in specimine femineo) inferiora ovali-elliptica vel elliptico-obovata, superiora majora elliptica vel elliptico-lanceolata, basi obtusa rotundave, apice acuta vel summo breviter acuminata, inferiora ut videtur satis evoluta (minimis exceptis) 3.5:1.5 ad 5.5:2.3 cm. magna, superiora ad 7:2.5 vel 8:1.7-2 cm. magna, in speciminibus masculis pleraque angustiora, interdum oblanceolata, 3:0.7 ad 8:1.5 cm. magna, superne initio pl. m. sericeo-villosa, cito glabrescentia, adulta probabiliter glabra vel tantum in costa flavescente plana pl. m. pubescentia, intense viridia, subtus valde discoloria, initio dense griseo- vel ferrugineo-villosa, dein glabrescentia, glaucescentia, pruinosa, costa nervisque lateralibus utrinsecus ad 12 angulo 60-45° a costa abeuntibus versus marginem currentibus pl. m. prominulis flavescensibusque, margine pl. m. dense subdistincte glanduloso-serrato-denticulata, versus basim integerrima. Petioli 1-8 mm. longi, superne sulcati, undique villosulo-tomentelli. Stipulae parvae, lineari-lanceolatae, subglabrae, denticulatae, petiolis 2-3plo breviores, cito deciduae. Amenta tardiva, ramulos normaliter foliatos 1-2 cm. longos terminantia, rhachi villosa; mascula cylindrica, ad 3.5:0.8 cm. magna, densiflora; bractae obovatae vel late ovato-oblongae, obtusae vel rotundatae, flavescentes, utrinque villosae vel apicem versus glabrescentes, 2-3.5 mm. longae; stamina pleraque 5, filamentis ad medium fere villosis, antheris flavis elliptico-globosis; glandulae 2, pl. m. lobatae, rarius simplices; amenta feminea semimatura ad 4.5 cm. longa et 1.3-1.5 cm. crassa, cylindrica vel elliptico-cylindrica, fructibus valde congestis; bractae late oblongae, obtusae, villosulae, apice glabriores, pedicellum paullo vel vix superantes; ovaria semimatura (juvenilia ignota) ovoideo-conica, basi subacuta, apice obtusa, circ. 4 mm.



longa, basi et pedicello subcrasso iis subduplo brevior pilosa, ceterum glabra, stylo brevi stigmatibus brevibus subbifidis satis latis vix longiore coronata; glandula 1, late ovato-rectangularis, quam pedicellus 3(-4)plo brevior, satis crassa.

TYPE LOCALITY.—Mexico: State of Jalisco, Ferreria, and Sierra de Nayarit.

RANGE.—As above, possibly also in Terr. Tepic, to which part of the Sierra de Nayarit belongs (probably also in the state of Michoacan, see note below).

SPECIMENS EXAMINED.—Mexico: State of Jalisco, Sierra de Nayarit, without date, *Léon Diquet* (male paratype; N.); Ferreria, May 28, 1898 (2?), *M. E. Jones* (no. 437; female type of description, probably also co-type of Jones, who gives no number and as year 1892; M.); without any locality or date, *G. H. G[raham]*<sup>10</sup> (m., ex Herb. J. S. Mill in Herb. G.; identical with Diquet's specimen).

The specimens before me agree well with JONES'S description, who collected only the female plant. No. 437 is very likely the same as the plant cited by him as type. It seems to me more closely related to *S. Bonplandiana* or *S. longipes* than to *S. laevigata* mentioned by JONES. Unfortunately, there are no fully grown leaves; the largest I have seen resemble those of *S. longipes*. In size and shape of the female aments and of the fruits it comes very near *S. Bonplandiana*. The male aments are remarkably small and fine, hardly as long or longer than the narrowly lanceolate leaves of the peduncle.

6. *S. BONPLANDIANA* Kunth in Humboldt and Bonpland, Nov. Gen. Pl. 2:20. pls. 101, 102. 1817; Syn. Pl. Aequin. 1:365. 1822; Martens and Galeotti in Bull. Acad. R. Bruxelles 10<sup>1</sup>:343 (Enum. Pl. Galeot. Mex. 3). 1843; Andersson in K. Sv. Vet.-Akad. Handl. 6:18, pl. 1, fig. 14 (Mon. Salic.). 1867, excl. var.; in DC. Prodr. 16<sup>2</sup>:200. 1868, excl. var.; Hemsley in Biol. Centr. Am. Bot. 3:179. 1883, excl. var.; Brandege in Proc. Cal. Acad. Sci. II. 3:173. 1891; Wootton and Standley in Contrib. U.S. Nat. Herb. 19:161 (Fl. N.Mex.). 1915; Goldman in Contrib. l. c. 16:320. 1916.

TYPE LOCALITY.—“In regno Mexicano locis opacatis prope Moran, Cabrera, Omitlan et Pachuca,<sup>11</sup> alt. 1270-1350 hexap.” (coll. *Humboldt* and *Bonpland*, ex Kunth).

<sup>10</sup> According to BENTHAM, Pl. Hartw. preface p. 4. 1839, GRAHAM collected “about the town of Mexico and in the mining district of Tlalpuxahua and Real del Monte.” Tlalpuxahua is in the state of Michoacan, 50 miles east of Morelia.

<sup>11</sup> These localities are probably all in the state of Hidalgo; see Humb. and Bonpl., Nov. Gen. Pl. 7:341. 1825.

RANGE.—The typical form extends from the southwestern corner of New Mexico through the states of Chihuahua, Durango, southern Coahuila, southern Lower California, to Oaxaca and Vera Cruz, and probably farther south in Mexico, because the species occurs again in Guatemala (see below); see also under var. *Toumeyii*.

SPECIMENS EXAMINED.—New Mexico: Grant County, Canyon east side of San Luis Mountains, September 11, 1893, *E. A. Mearns* (no. 2189, m.; M., N.).—Mexico: State of Chihuahua, Canyon below Cusihiuriachic, September 21, 1888, *C. G. Pringle* (no. 2003, m., fr.); in the Sierra Madre near Seven Star Mine, alt. 2300 m., September 4, 1899, *C. H. T. Townsend* and *C. M. Barber* (no. 405, f., fr.; G., M.; forma porro observanda, an ad var. *Toumeyii* referenda?).—State of Coahuila, Jaral, [?June] 10, 1886, *W. Schumann* (no. 1318, m.; W.).—State of Durango, vicinity of Durango, [autumn] 1896, *E. Palmer* (no. 636, f., fr.).—Lower California, near Creek San Pablo, alt. 180–220 m., January–March 1898, *C. A. Purpus* (no. 140, m., fr.; W.); from El Saccaton to Cape San Lucas, alt. 10–150 m., December 29, 1905, *E. W. Nelson* and *E. A. Goldman* (no. 7373, m.; W.); from Miraflores to San Bernardo Ranch in Sierra La Laguna, alt. 450 m., January 20, 1906, same coll. (no. 7419, m.; W.).—State of San Luis Potosi, “ex convalli San Luis Potosi,” 1877, *J. G. Schaffner* (no. 263, f.; N.).—State of Hidalgo, Tula, river banks, alt. 2000 m., August 18, 1906, *C. G. Pringle* (no. 13788, m., f.; G., W.).—State of Queretaro, near San Juan del Rio, August 18, 1905, *J. N. Rose*, *J. H. Painter*, and *J. G. Rose* (no. 9600, fr.; N.).—State of Guanajuato, Guanajuato, September and November 1897, *A. Dugès* (m., fr.; G., W.).—State of Jalisco, Guadalajara, February 28, 1907, *W. E. Safford* (no. 1425, st.; W.; “an important tree planted for shade”); near Tequila, July 5–6, 1899, *J. N. Rose* and *W. Hough* (no. 4768, im. fr.; W.).—State of Michoacan, valley near Zinapecuaro, east of Morelia, May 2, 1849, *J. Gregg* (no. 767, st.; M.; “tree 30 ft. high”); wet places near Patzcuaro, November 20, 1890, *C. G. Pringle* (no. 3376, m., f.).—Federal District, “Vallée de Mexico,” June 18, 1865, *E. Bourgeau* (no. 423, m., f.; G., W.); same locality, alt. 2200 m., August 17, 1901, *C. G. Pringle* (no. 9337, m., f., fr.; G., M., W.); also August 12, 1899, *C. G. Pringle* (no. 7916, m., f.; G.; “small tree”); without exact locality, September 16, 1910, *C. R. Orcutt* (no. 4070, m.; M.); without any locality but probably in this district, *G. J. G[raham]* (m.; G.).—State of Morelos, by streams near Cuernavaca, alt. 1500 m., August 14, 1906, *C. G. Pringle* (no. 10284, m., f.; G., M., W.); also June 9, 1904, *C. G. Pringle* (no. 13203, m., f., fr.; G., W.).—State of Puebla, Tehuacan, *H. Galeotti* (no. 67, m.; N.).

The typical *S. Bonplandiana* is a well marked species which produces its flowers in the axils of the mature leaves from July to January, the old leaves not falling off until the new growth starts. This habit gives the species a peculiar appearance, but cannot be regarded as a valuable taxonomic character because it seems due to climatic conditions. The following specimens from Guatemala, therefore, hardly represent a different variety but only a

form the flowers of which appear with the development of the young leaves. Nevertheless, this most southern form of *S. Bonplandiana* needs further observation. The young twigs and the upper surfaces of the young leaves show a scanty pubescence of rather long downy silky hairs. TUERCKHEIM'S specimens have been regarded as belonging to *S. laevigata* by BEBB, but in my opinion they are much more similar to *S. Bonplandiana* than to the other species.

Guatemala: Dept. Alta Verapaz, "am Cobanflusse bei Coban," alt. 1360 m., February 1886, *A. v. Tuerckheim* (no. 333, m., f.; G., W.; ab J. D. SMITH sub nomine *Humboldtiana falcata* distributa, praeterea a cl. BEBB *S. laevigata* nominata); same place, alt. 1360 m., November 1907, *A. v. Tuerckheim* (no. II. 1526, f., fr.; G., M., W.; eadem forma ac no. 333 sed folia novella superne laxe sericeo-villosa cito glabrescentia).—Dept. Baja Verapaz, between Tactic and Salancá, June 5, 1904, *O. F. Cook* (no. 217, st.; W.)—Dept. Huehuetenango, roadside near Huehuetenango, alt. 1950–2600 m., January 10–11, 1896, *E. W. Nelson* (no. 3677, m.; W.)—Dept. Solalá, San Lucas, February 15–16, 1906, *W. A. Kellerman* (nos. 5693, 5819, st.; W.); Volcano of Santa Maria, alt. 2600–3500 m., January 24, 1906, *E. W. Nelson* (no. 3725, f., fr.; G., W.)—Dept. Sacatepequez, Santa Maria de Jesus, cult. in hedge, February 18, 1905, *W. A. Kellerman* (no. 4528, st.; W.).

6b. *S. BONPLANDIANA*, var. *PALLIDA* And. in DC. Prodr. 16<sup>2</sup>: 200. 1868; Hemsley in Biol. Centr. Am. Bot. 3: 179. 1883; Brandege in Proc. Cal. Acad. Sci. II. 2: 205. 1889, fide auctor; Bebb apud Vasey and Rose in Contrib. U.S. Nat. Herb. 1: 77. 1890.—*S. pallida* Kunth in Humb. and Bonpl., Nov. Gen. Pl. 2: 20. 1817; *S. Bonplandiana* \**S. pallida* And. in K. Sv. Vet.-Akad. Handl. 6: 18 (Mon. Salic.). 1867.

A typo nonnisi recedit ramulis novellis petiolisque satis vel parce villosulis foliis etiam saepe ad costam pl. m. pilosis.

TYPE LOCALITY.—"In calidis regni Novae Hispaniae inter Venta de Acaguisotla et Masatlan<sup>12</sup>) alt. 500–650 hexap." (coll. *Humboldt* and *Bonpland*, ex Kunth).

RANGE.—Central Mexico (probably also in Lower California).

SPECIMENS EXAMINED.—State of San Luis Potosi, without exact locality, 1877, *J. G. Schaffner* (no. 263, f.; W.); "in locis cultis circa urbem San Luis Potosi," 1876, *J. G. Schaffner* (no. 895 partim, f.; G.; mixed with sterile specimen of *S. Humboldtiana* var. *stipulacea*).—State of Puebla, Atlixco, July 25, August 1, 1893, *E. W. Nelson* (m.; W.; ramulis tantum apice parce pilosis).—State of Jalisco, near Huejuquilla, August 24, 1897, *J. N. Rose* (no. 2535, m.;

<sup>12</sup> These localities which I cannot find on the maps at my disposal seem to be in the state of Guerrero according to Humb. and Bonpl., Nov. Gen. Pl. 7: 341. 1825.

W.; ut praecedens).—State of Oaxaca, Valle de Etla, alt. 1580 m., April 1906, C. Conzatti (no. 1721, fr.; W.).

It is on the authority of ANDERSSON that I refer these specimens to var. *pallida*. Without having seen a type specimen I cannot decide whether KUNTH'S species really represents a variety of *S. Bonplandiana*. The specimens before me are in my opinion nothing but a more or less pubescent form and hardly deserve the rank of a variety. The geographical distribution is probably the same as that of the species. Almost every species of the American PLEIANDRAE breaks up in a hairy and a glabrous variety which sometimes look very different, but mostly seem to be connected by every grade of intermediate forms.

6c. *S. BONPLANDIANA*, var. **Toumey** Schn., var. nov.—*S. Bonplandiana* Bebb in Gard. and For. 8:364. 1895, non Kunth; Sargent N.Am. Silva 9:119. pl. 472. 1896, exclud. syn. pro parte max.; *S. Toumey* Britton, N.Am. Trees 187, fig. 145. 1908; *S. Humboldtiana* Sarg. ex Britton, l. c., pro synonym., non Willd.—Ab typo nonnisi differre videtur foliis plerisque angustioribus minus distincte denticulatis, petiolis saepissime satis brevibus vix ultra 1 cm. longis apice haud vel valde indistincte glandulosis, amentis fere semper primo vere in axillis foliorum persistentium apparentibus vel (foliis adultis delapsis) praecocibus vel coetaneis masculis brevioribus vix ultra 3 cm. longis et fructiferis vix ultra 2.5:1-2.2 cm. magnis, glandula dorsali florum femineorum interdum minima.

TYPE LOCALITY.—Southern Arizona: Pima County, Santa Catalina Mountains, Sabino Canyon.

RANGE.—Southeastern Arizona, northern Sonora and Chihuahua (? southwestern New Mexico and Lower California).

SPECIMENS EXAMINED.—Arizona: Pima County, Santa Catalina Mountains, Sabino Canyon, February 20, July 23, 1894, J. W. Toumey (f., fr., paratype; N.); also April 8, October 7, 1894, J. W. Toumey (st.); also February 15, March 12, April 8, 1894, J. W. Toumey (m., f., fr.; "tree 25-50 ft., deeply furrowed bark"); same place, April 10, 1901, C. L. Shear (no. 4201, m., fr.; type; N.); same place, alt. 800 m., August 24, 1903, Thornber (no. 169a, f.; M.; a forma typica *S. Bonplandiana* vix distinguenda); same place, March 30, 1901, D. Griffith (no. 2577, m.; N.).—Mexico: State of Sonora, Guadalupe Canyon, August 28, 1893, E. C. Merton (no. 2071, st.; W.; forma aliquid incerta).—State of Chihuahua, Cajou Bonita Creek, July 24, 1892, E. A. Mearns (no. 553, st.; W.; "a tree 80 cm. in circumference and 10 m. high"; forma porro observanda).—Lower California, without exact locality, March-June 1897, A. W. Anthony (fr., W.; forma aliquid incerta).

I am not sure whether this variety can be regarded as more than a mere form of *S. Bonplandiana*, but judging by the rather insufficient material before me I think it best to keep it as a variety, to which probably the specimen from southwestern New Mexico, enumerated under the type, should be referred. There is a specimen collected by *E. Palmer* in the state of Durango, at Tepehuanes, March 25–April 16, 1906 (no. 9, m.; M., W.) which looks like a pubescent form of var. *Toumeyii* corresponding with the var. *pallida* of the type.

7. *S. LAEVIGATA* Bebb in Amer. Nat. 8:202. 1874; in Watson, Bot. Calif. 2:83. 1879; Ball in Trans. Acad. Sci. St. Louis 9:69. 1899.

I mention this willow only because its occurrence might be expected in northern Lower California, but I have not yet met with a specimen of it from this region. As I have explained, the Guatemalan willow referred by BEBB to *S. laevigata* belongs to *S. Bonplandiana*. *S. laevigata* is the western counterpart of the eastern *S. longipes*.

8. *S. LONGIPES* Shuttleworth apud And. in Öfv. K. Vet.-Akad. Förh. 15:114 (Bidr. Känned. Am. Pilarter). 1858; in Proc. Amer. Acad. 4:53 (Sal. Bor. Am. 7). 1858; in Walp., Ann. Bot. 5:744. 1858.—*S. occidentalis* Bosc apud Koch, De Sal. Eur. Com. 16. 1828, non Walter 1788; And. in K. Sv. Vet.-Akad. Handl. 6:23, pl. 2, fig. 16 (Mon. Salic.). 1867; in DC. Prodr. 16<sup>2</sup>:202. 1868; Bebb in Gard. and For. 8:364. 1895, in adnot.; Sargent, Silva N.Am. 9:109, pl. 465. 1896, excl. var. pro parte; *S. subvillosa* Elliott ex Nuttall, N.Am. Silva 1:79. 1843, nom. nud.; *S. longipes*, var. *pubescens* And. in Öfv., l. c. 114; in Proc., l. c. 53; in Walp., l. c. 744; *S. gongylocarpa* Shuttlew. apud And., l. c., pro synonym.; *S. floridana* Chapman, Fl. S. U.S. 430. 1860; *S. Humboldtiana* Grisebach, Cat. Pl. Cub. 41. 1866, non Willd.; *S. nigra* \*\*\**S. longipes* And. in K. Sv., l. c. 22; excl. var. *venulosa*; *S. nigra*  $\gamma$  *longipes* And. in DC., l. c. 201. excl. f. *venulosa*; *S. Bonplandiana* Sauvalle, Fl. Cuba 134. 1873, non Kunth; De la Maza and Roig, Fl. Cuba 64. 1914; *S. occidentalis*, var. *longipes* Bebb in Gard. and For. 8:363. 1895; *S. amphibia* Small, Fl. Miami 61. 1913.

TYPE LOCALITY (of *S. occidentalis* Bosc).—"In insula Cuba" (coll. Sieber, ex Koch).

RANGE.—The typical form, to which the synonymy given above applies, is found from Cuba to northern Florida (Duval and Wakulla counties).

SPECIMENS EXAMINED (from Cuba).—Prov. Pinar del Rio, Galafre, March 7, 1911, *N. L. Britton* and *J. F. Cowell* (no. 9839, m., st.; N., W.);

Pinar del Rio, 1911, *J. F. Cowell* (st.).—Prov. La Habana, San Antonio de los Baños, December 18, 1905, *Van Hermann* (no. 3332, fr.); Playa de Mariano, February 22, 1910, *N. L. Britton* and *P. Wilson* (no. 4521, f.; G., N., W.); Batabano, wet coastal Savanna, April 12, 1912, *N. L. Britton*, *J. F. Cowell*, and *C. de la Torre* (no. 13359, st.; N., W.).—Prov. Santa Clara, Cienaga de Zapata, March 26 [1860-64], *C. Wright* (no. 2132, m., st.; G., M., W.).—Prov. Camaguey "ad las Piedras," February 1824, *Poeppig* (f.; M.).

This species, which is well represented in the southeastern and central United States by var. *Wardii* (Bebb) Schn., nov. comb., and by var. *venulosa* (And.) Schn., is said by ANDERSSON to occur also in Trinida[d]. Beyond the borders of the United States I have only seen the specimens cited from Cuba. It seems to be entirely absent from Mexico, and I shall deal with this difficult and variable species in my final book.

Sect. IV. LONGIFOLIAE And. in Öfv. K. Vet. Ak.-Förh. 15:116. 1858; in Proc. Amer. Acad. 4:55 (Salic. Bor. Am. 10). 1858; in Walp., Ann. Bot. 5:745. 1858; in K. Sv. Vet.-Akad. Handl. 6:54 (Mon. Salic.). 1867; in DC. Prodr. 16<sup>2</sup>:214. 1868; Bebb in Bot. GAZ. 16:103. 1891; Rowlee in Bull. Torr. Bot. Club 27:247. 1900; Schneider, Ill. Handb. Laubh. 1:32. 1904; Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 130. 1909.

This is a well marked and entirely American section. There are no other willows closely related to those of this section, either in America or in the Old World. Probably the species of the sect. ALBAE Borr. (not of sect. FRAGILES Koch) may represent the nearest relatives to the LONGIFOLIAE. In Mexico there is only one species widely distributed; the other forms of this group mentioned later reach our territory only in its most northern parts. It may be mentioned that, according to GÄRTNER (Vergl. Blattanatomie Gatt. *Salix*, Diss. Göttingen, 1907, p. 54) *S. macrolepis* Turcz. from Northeastern Asia shows "eine so ausgesprochene Aehnlichkeit im Blattbau, dass es keinen Augenblick zweifelhaft sein kann, dass die nächsten Verwandten von *S. macrolepis* Arten wie *S. Hindsiana* und *S. longifolia* sind." I have dealt with this interesting Asiatic species in Sargent, Pl. Wilson. 3:102. 1916, but I have seen only a poor specimen. Even if GÄRTNER has examined material of the true *macrolepis*, I am not convinced that similar anatomical characters can be taken for a proof of close taxonomic relationship in a case where the morphological characters of the flowers are, apparently, so different.

9. *S. TAXIFOLIA* Kunth in Humb. and Bonpl., Nov. Gen. Pl. 2:18. 1817; Syn. Pl. Aequinoct. 1:364. 1822; And. in Öfv., l. c. 117, excl. var. *microphylla*; in Proc., l. c. 56(11); in Walp., l. c. 746; in K. Sv., l. c. 57, pro parte; in DC., l. c. 215, pro parte; Hemsl. in Biol. Centr. Am. Bot. 3:180. 1883; Brandegee in Zoe 4:406. 1894; Rowlee in Bull., l. c. 249, *pl. 9, fig. 2*; Jones, Willow Fam. Gr. Plat. 25. 1908; Goldman in Contrib. U.S. Nat. Herb. 16:321. 1916. ?*S. taxifolia*, b *lejocarpa* And. in K. Sv., l. c. 57; in DC., l. c. 215; ?*S. taxifolia* a *sericocarpa* And., l. c. 57; ?*S. taxifolia* a *sericocoma* And. in DC., l. c. 215.

TYPE LOCALITY.—“Colitur in Hortis Mexici, Queretari, Zelayae, alt. 900–1200 hex.”

RANGE.—From Mexico I have seen wild specimens only from the state of Durango and Chihuahua, and also from Lower California. It is also found in southeastern Arizona, southern New Mexico, and southwestern Texas.

SPECIMENS EXAMINED.—Mexico: State of Durango, vicinity of the city of Durango, August 1896, *E. Palmer* (no. 473, m.; the specimen in the Gray Herbarium consists of two forms, the leaves of the left one being rather short and broad).—State of Chihuahua, valley near Chihuahua, October 5, 1885, *C. G. Pringle* (no. 23½, m., f., fr.); same place, April 6, 1886, *C. G. Pringle* (no. 864, m.; W.); near Balleza, September 23, 1898, *E. H. Goldman* (m.; G.); Cajou Creek, near the U.S. Boundary line, July 2, 1892, *E. A. Mearns* (no. 398, st.; N., W.); San Pedro River, October 12, 1892, *E. A. Mearns* (no. 1111, m.; N.).—Lower California, Santa Anita (Cape Region), March 1901, *C. A. Purpus* (no. 232, m.; W.; forma satis latifolia); from San Bernardo to El Sauz, Sierra La Laguna, January 21, 1906, *E. W. Nelson* and *E. A. Goldman* (no. 7434, m.; W.); Corral Piedra, September 9, 1893, *J. G. Brandegee* (f.; W.).—Without exact locality, 1846, *T. Hartweg* (no. 391, m.; ex Herb. Hooker in Herb. N.).

I have not yet seen a type specimen of the typical *S. taxifolia* of which HUMBOLDT and BONPLAND apparently collected only specimens of cultivated plants. All the specimens before me from central and southern Mexico belong to var. *microphylla*. The typical form seems to be restricted to the central and western part of northern Mexico, where it occurs probably, also in Sonora, and to the parts of the southern central United States mentioned.

There are the following specimens from Chihuahua which come very near typical *S. taxifolia*, but in some respects resemble *S. exigua* (var. *stenophylla*). They may be regarded as belonging to a separate form of *S. taxifolia* also represented in the United States which I am not yet able to interpret correctly. I hope I can deal with it finally in my future book. Bachimba Canyon, March 23, 1885, *C. G. Pringle* (no. 95; f.; G.); vicinity of Chihuahua, alt. about 1300 m., April 8–27, 1908, *E. Palmer* (no. 39, m.; G., M., W.). Another

specimen collected by *Wilkinson*, April 4, 1885 (m.; W.), the exact locality of which I cannot discover, shows rather large elliptic anthers.

The varieties distinguished by ANDERSSON as var. *lejocarpha* and var. *sericocarpha* (*sericocoma*) with glabrescent or densely hairy capsules I cannot identify because he does not cite any specimens. The young ovaries are always pubescent, and even the ripe fruits seem to be never wholly glabrous. See also my remarks under the following variety.

9b. *S. TAXIFOLIA*, var. **microphylla** Schn., nov. var.—*S. microphylla* Schl. and Cham. in *Linnaea* 6:354. 1831; Hooker and Arn., *Bot. Beech. Voy.* 310. *pl.* 70. 1840; Mart. and Gal. in *Bull. Acad. R. Brux.* 10<sup>1</sup>:345 (*Enum. Pl. Gal. Mex.* 5). 1843; Rowlee in *Bull. Torr. Bot. Club* 27:249. 1900, pro parte; *S. taxifolia* And., l. c. and Hemsl., l. c. (sub *taxifolia*) pro parte, non Kunth; Loes. in *Bull. Herb. Boiss.* 7:545 (*Pl. Seler.* 67). 1899.—A typo praecipue recedit: pubescentia ramulorum novellorum magis villosa vel fere subhirsuta, foliis ut videtur minus crassis subtus magis discoloribus distinctius sericeis interdum oblanceolatis et pro longitudine satis latis distinctius denticulatis, stipulis ovato-lanceolatis vel lanceolatis petiolo brevissimo sublongioribus, floribus masculis fere semper glandula tantum ventrali praeditis, amentis fructiferis subcrassioribus 2:1.2 cm. magnis.

TYPE LOCALITY.—Mexico, state of Vera Cruz, “ad ripam arenosam fluminis Tecolutensis prope San Pablo.”

RANGE.—Central Mexico to Guatemala and Porto Rico. I have seen specimens from the states of Vera Cruz, San Luis Potosi, Coahuila, Terr. Tepic, Jalisco, Michoacan, Morelos, Puebla, Oaxaca, and from Guatemala and Porto Rico.

SPECIMENS EXAMINED.—The numerous Mexican specimens I have seen will be enumerated in my final book. Guatemala: on the river Pinula, on the road from Guatemala to Amatillan, 1845, *Skinner* (f., ex Herb. Bentham in Herb. N.).—Porto Rico: “Lago San José, près San Juan, October 1909,” *Hiorámi* (m.; G.; an indigena?).

This variety is undoubtedly very closely related to the typical *taxifolia* and can hardly be regarded as a good species. The principal characters have already been stated. In *S. taxifolia* the leaves are somewhat longer, narrower, and more entire, the stipules are wanting or scarcely developed, the male flowers always possess a dorsal gland, and the fruiting aments are, usually, more slender.

The form regarded by ROWLEE as *S. microphylla* does not in my opinion fully agree with the typical one collected by *Schiede* and *Deppe* of which I have



seen a sterile co-type (Herb. M.). ROWLEE's form is apparently identical with that described and figured by HOOKER and ARNOTT, but the flowers of the only specimen seen by ROWLEE from Colima (leg. *E. Palmer*, no. 1193, January 9 to February 6, 1891; m.; G., W.) possess mostly two glands. It seems to me somewhat intermediate between the typical *taxifolia* and var. *microphylla* s. str. and needs further investigation.

10. *S. EXIGUA* Nutt., var.—*S. exigua* Goldman in Contrib. U.S. Nat. Herb. 16:320 (Pl. Low. Cal.). 1916.

*S. exigua* Nutt. sensu latissimo is a wide spread willow from the Northwest Territories through the western United States (except along the Pacific Coast and the most of California) to Arizona, southern California, and New Mexico. In my opinion this species may be divided into several varieties which of course seem to be connected by intermediate forms. Having not yet finished my study of those forms I am not able to determine the following few specimens from Mexico with certainty. I can only enumerate them and add a few notes.

There is, first, a specimen from Lower California: Arroyo de Leon, northwest slope of the San Pedro Martir Mountains, alt. 950 m., July 4, 1905, *A. E. Goldman* (no. 1200, m.; W.). It can probably be referred to *S. exigua*, var. *stenophylla* (Rydbg.) Schn., nov. var.,<sup>13</sup> but owing to the absence of female flowers I am not sure of its relationship. To the same form seems to belong a male specimen from Chihuahua: along the Rio Grande, near Ciudad Juarez, 1911, *E. Stearns* (mixed in Herb. N. with a fruiting branch of *S. Gooddingii*). *C. G. Pringle's* no. 23 from the same state, Bachimba Canyon, May 30, 1885 (m.; G.), which has been distributed as *S. taxifolia*, probably represents the same form of *exigua* with early flowers which always look rather different from those appearing later in the season on longer, more leafy peduncles. The aments are very short, but the material is too insufficient to say more. At

<sup>13</sup> *S. stenophylla* Rydberg in Bull. Torr. Bot. Club 28:272. 1901 has been described from Colorado as "nearest related to *S. exigua* Nutt." It is, in my opinion, not a good species, but probably more than "an inconstant form" (Ball in Coult. and Nels., New Man. Rocky Mt. Bot. 131. 1909), and I am inclined to use this name for what I call the southeastern and southern variety of *exigua*, the typical form of which seems to be confined to Nevada (and some of the adjacent counties of California), eastern Oregon, Idaho, western Montana, eastern Washington and northward; while var. *stenophylla* extends from Wyoming to eastern Nebraska (in probably a little different form), Colorado, New Mexico, Arizona, and probably northern Chihuahua. The forms from southern California and northern Lower California may be more closely related to typical *exigua*. The var. *stenophylla* differs chiefly in having folia saepe distinctius denticulata (interdum fere ut in *S. longifolia*), ovaria (vel saltem fructus) longius pedicellata pedicello glandulam saepissime 2plo superante, glabriuscula vel ab initio glabra. The oldest name for this form may be *S. Hindsiana*, var. *tenuifolia* And., Mon. p. 56, of which I have not yet seen the type (*Burke*, Snake River).

first sight *C. G. Pringle's* no. 220 from Ciudad Juarez (the former Paso del Norte), May 4, 1885 (m., f.; N.), looks very similar to *S. exigua*, var. *stenophylla*, but the stigmas are rather long and slender. This form needs special observation.

Somewhat more different are specimens from Lower California: near the Tia Juana, April 6, 1882, *M. E. Jones* (no. 3730, m., f.; N., W.), the female flowers of which have rather long stigmas more or less intermediate between those of the flowers of *S. exigua* and *S. sessilifolia* Nutt. The ovaries are glabrous and have a pedicel of about the same length as the gland. There are a few old leaves (apparently of the previous season) which closely resemble those of *S. sessilifolia*, var. **leucodendroides** (Rowlee) Schn., nov. comb. (*S. macrostachya*, var. *leucodendroides* Rowlee in Bull. Torr. Bot. Club 27:250. pl. 9. fig. 6. 1900), the most southern form of *sessilifolia* Nutt. sensu lato. There may be hybrids between this variety and *exigua* in southern California and in the adjacent parts of Lower California where var. *leucodendroides* is likely also to occur. JONES'S specimens represent the early flowering form with rather shortly peduncled aments. "The peculiar swelling just below the stigma," which, according to RYDBERG, is a main feature of his *S. stenophylla*, may be observed in almost every form of *exigua*, *longifolia*, or other species of this section. The form collected by *Jones* may be identical with that of *LeRoy Abrams* on the Tia Juana River in San Diego County, California, May 14, 1903 (no. 3485, f., fr.; G.), which I can hardly distinguish from typical *exigua*.

There remains another doubtful form from Chihuahua, Puerta de St. Diego, alt. 1800 m., April 13, 1891, *C. V. Hartman* (no. 625, m.; "8-12 ft. high"), which has been distributed as *S. taxifolia*. It is a very early flowering form with small sessile ovoid aments (6-12 mm. long) and very narrow short young leaves (up to 12 by 0.5 mm.). According to the globular anthers it may be an unusually early flowering *taxifolia*; on the other hand one might regard it as an abnormal state of *exigua stenophylla*.

11. *S. LONGIFOLIA*, var. *ANGUSTISSIMA* And. in Öfv. K. Vet.-Ak. Förh. 15:116. 1858, excl. specim. *Wrightii* no. 1875; in Proc. Amer. Akad. 4:56 (Sal. Bor. Am. 10). 1858; in Walp., Ann. Bot. 5:746. 1858.—*S. longifolia* \*\*\* *opaca* And. in K. Sv. Vet.-Akad. Handl. 6:55 (Mon. Salic.). 1867, quoad specim. *Berlandierii* no. 2341; *S. longifolia*  $\gamma$  *argyrophylla* And. in D.C Prodr. 16<sup>2</sup>:214. 1868, quoad specim. *Berlandierii* no. 2341 (sphalm. 2371); Coulter in Contrib. U.S. Nat. Herb. 2:419 (Man. Phan. W. Texas). 1894, prob. pro parte maxima; *S. Thurberi* Rowlee in Bull. Torr. Bot. Club 27:252. 1900; Blankinship in Rep. Mo. Bot. Gard. 18:194. 1907.

TYPE LOCALITY.—Probably Texas, exact locality unknown to me (coll. *Berlandier*).

RANGE.—Central Texas to New Mexico (Dona Ana County) and north-eastern Mexico (Coahuila and Nuevo Leon).

SPECIMENS EXAMINED (from Mexico).—State of Coahuila: Jimulco, by streams, alt. 1300 m., October 10, 1905, *C. G. Pringle* (no. 10086, m.; N., W.; "a medium sized tree").—State of Nuevo Leon: Monterey, along the stream through city, May 1891, *C. K. Dodge* (no. 132, m.; M., W.; looks somewhat like var. *angustissima* × *S. taxifolia*).

This willow seems to me very closely related to *longifolia* and apparently connected with it by intermediate forms. I do not regard it as a distinct species, but I cannot agree with WOOTON and STANDLEY, in *Contrib. U.S. Nat. Herb.* 19:160 (Fl. N.Mex.). 1915, that "*S. Thurberi* Rowlee is a form [of *exigua*] with longer leaves that are noticeably dentate," and that "it is not essentially different from *S. exigua*" as understood by these authors. The main difference of var. *angustissima* from typical *longifolia* is the absence of a dorsal gland in the male flowers and the dense silvery silky (shining) pubescence of the young ovaries. The leaves of the fertile branchlets are up to 4–8 cm. long and 1.5–5 mm. wide. The dentation and nervation are those of typical *longifolia*.

ROWLEE made a mistake in attributing all his specimens of *Thurber* (nos. 2368, 95, and 2341 in the Gray Herb.) to *G. Thurber*. Only no. 95 was collected by *Thurber*, while nos. 2341, 2368 are numbers of *Berlandier* and have been cited by ANDERSSON with nos. 911 and 3019 as the co-types of his var. *angustissima*, a fact not mentioned at all by ROWLEE.

There is a sterile specimen from the state of Durango, alluvial valley of Rio Nazas, April 14, 1847, *J. Gregg* (no. 442; M.), which may belong to our variety. The young leaves measure up to 7 cm. in length and 6 mm. in width.

There remains another specimen of a willow of this section from Lower California, ?Causito, May 20, 1883, *C. R. Orcutt* (no. 1180, fr.; M.; distributed as *longifolia*), which possibly represents the form called *S. Parishiana* by ROWLEE in *Bull. l. c.* 249. Unfortunately I have not yet had the opportunity to examine the types of ROWLEE'S species, collected by *F. W. Hobby* in southern California, San Bernardino County, Matilija Canyon (nos. 54, 55). As far as I can judge by the somewhat inexact description and by the material I have seen from southern California, *S. Parishiana* might be regarded as a species intermediate between *exigua* and *sessilifolia leucodendroides*, differing from the latter in the narrower, more glabrescent leaves and the shorter and slenderer fruiting aments, and from the former in the longer, narrower, more linear lobes of the stigma mostly borne by a short style. *Orcutt's* specimen has short old fruiting aments measuring not over 2 cm. in length and 8 mm. in thickness. According to ROWLEE'S statement in his description, the aments are "2–3 cm. long by 1–2 cm.," but in the key he says "aments medium size, 3 cm. or more in length."

Sect. V. SALICES DIANDRAE, excl. LONGIFOLIAE.<sup>14</sup>

12. *S. HARTWEGII* Benth. Pl. Hartw. 52. 1840; Hemsl. in Biol. Centr. Am. Bot. 3:180. 1883.—*S. humilis* \**S. Hartwegii* And. in K. Sv. Vet.-Akad. Handl. 6:112, pl. 6, fig. 62\* (Mon. Salic.). 1867; *S. humilis*  $\delta$  ?*Hartwegii* And. in DC. Prodr. 16<sup>2</sup>:236. 1868.—Ad descriptionem brevem auctoris addenda et emendanda: habitus?, ramuli hornotini (autumno floriferi) pl. m. dense griseo-vel flavescenti-tomentelli, angulati, versus basim et annotini purpureofusci glabriusculi, vetustiores ut videtur glabri, lenticellis late ellipticis flavis paucis conspersi. Gemmae foliiferae ovatae sed rostratae, ventre subapplanatae, lateraliter leviter carinatae, glabrae vel apice sparse pilosae, ad 8 mm. longae. Folia elongato-lanceolata vel anguste elliptico-lanceolata, basi acuta vel subobtusata, satis subito in petiolum contracta, apice acuta vel brevissime tenuiter acuminata, 3.5:0.7 ad 9.5:1.6 cm. magna, superne intense viridia, ut videtur nitidula, initio etiam in facie sparse (an densius?) pilosa, dein tantum ad costam subprominentem (et partim ad nervos laterales) tomentella, subtus discoloria, glaucescentia vel cinerascens, pruinosa, initio pl. m. dense dein tantum ad nervos prominulos axillasque subbrunnescenti-vel griseo-villosulo-tomentella, costa elevata glabrescente, margine breviter et versus apicem distinctius glanduloso-denticulata. Petioli 2–8 mm. longi, superne sulcati, basi dilatati, undique tomentelli. Stipulae in ramis novellis satis distinctae, semicordatae, acutae, ad 7 mm. longae, glanduloso-denticulatae, ut folia pilosae. Amenta autumnis in axillis foliorum adultorum apparentia, sessilia, brevia, densiflora, rhachi villosa, basi perula gemmarum suffulta; mascula ad 1.8:0.7 cm. magna; bractee oblongae, apice truncatae, brunnescentes, praesertim ad basim utrinque longe pilosae; stamina 2, filamentis glabris liberis dein bractee duplo superantibus; glandulae duae, ventralis ovato-rectangularis, quam bractea 3–3½plo brevior, dorsalis minor; amenta feminea ad 2:1 cm. magna, ut videtur recurvata; ovaria ovato-lanceolata, in stylum distinctum iis circ. 4–5plo breviora

<sup>14</sup> I do not refer the following species to distinct sections because I do not yet know how to limit those sections to which these Mexican species belong. Some of them are very little known, and it needs further investigation to decide the question whether or not the species nos. 11–13 may form a special section on account of the dorsal gland present in the male flowers.

attenuata, pedicellis dimidio ovarii sublongioribus suffulta, glabra, stigmatibus linearibus bifidis stylo subaequilongis coronata; glandula 1, ovato-rectangularis, obtusa, pedicello 2-3plo brevior; bracteae oblongae, obtusae, ut in floribus masculis pilosae, pedicellum subsuperantes; fructus e basi subacuta ovoideo-lanceolati, subrostrati, circ. 4 mm. longi, pedicello 1.5-2 mm. longo excluso.

TYPE LOCALITY.—Mexico: State of Michoacan, prope Aganguio.

RANGE.—Central Mexico: States of Michoacan and Mexico.

SPECIMENS EXAMINED.—Mexico: State of Michoacan, "prope Aganguio," 1840, *Th. Hartweg* (no. 390, m.; co-type in Herb. N.).—State of Mexico, north slope of Volc. Toluca, September 9, 1893, *E. W. Nelson* (no. 26, f., fr.; W.).

This species seems most closely related to *S. mexicana* Seem., both possessing a dorsal gland in the male flowers. The late time of flowering cannot be regarded as a valuable taxonomic character because there are spring flowering forms of *S. mexicana*, and of *S. lasiolepis* I have seen forms of southern California flowering in the fall. The relationship of *S. Hartwegii* and the following species to *S. lasiolepis* and other species of sect. CORDATAE needs further investigation.

13. *S. MEXICANA* v. Seemen in Bot. Jahrb. 21, Beibl. 52:9. 1895.

TYPE LOCALITY.—Mexico: State of Hidalgo, Zacualtipan<sup>15</sup> (coll. *Berlandier*, ex Seemen).

RANGE.—Central Mexico: States of Hidalgo, Mexico, Puebla.

SPECIMENS EXAMINED.—Mexico: State of Hidalgo, Sierra de Pachuca, by brooks, alt. 2900 m., September 8, 1899, *C. G. Pringle* (no. 8237, f., m., st.; "10 to 15 ft."); same locality, alt. 2800 m., September 1, 1906, *C. G. Pringle* (no. 13783, m., f.; G., W.); Tulancingo, August 26, 1893, *E. W. Nelson* (m.; W.).—State of Puebla, Barranca below Honey Station, alt. 1680 m., September 9, 1906, *C. G. Pringle* (no. 13817, st.; G.).—State of Mexico, Ixtaccihuatl, along brooks, March 1906, *C. A. Purpus* (no. 1801, f., st.; G., M., W.).

The specimens before me agree well with v. SEEMEN'S description, and the Sierra de Pachuca is not far from the type locality. SEEMEN himself states that his species is closely related to *S. Hartwegii* (see above); especially by the presence of a dorsal gland which, however, is not mentioned by SEEMEN. It may easily be distinguished from *S. Hartwegii* by its glabrous branchlets and leaves, but the ovaries are glabrous in both the species, not hairy in *S. Hartwegii*, as SEEMEN states. The male specimen of *Nelson* shows a few remaining

<sup>15</sup> SEEMEN cites also "St. Pietro et St. Paulo (*Ehrenberg, Uhde*).” There are many localities of this name in Mexico, and not having seen the specimens I am not sure about the exact place where they were found.

hairs near the buds on the branchlets, a more distinct grayish silky pubescence of the bracts, and a very small dorsal gland.

14. **S. Schaffnerii** Schn., spec. nov.—Habitus (?), ramuli hornotini dense griseo-villoso-tomentelli, pl. m. angulati, obscure flavescens, annotini fuscescentes, paullo glabrescentes, vetustiores purpureo-fusci, ut videtur haud omnino glabrescentes. Gemmae foliiferae ovato-oblongae, adpressae, ventre applanatae, acutae, pl. m. villosa-tomentellae, subfuscae, ad 6 mm. longae, floriferae crassiores obtusioresque. Folio adulta subcoriacea, satis crassa, inferiora minora elliptico-oblonga, superiora longiora elliptico-lanceolata, basi acuta vel obtusiora, satis subito in petiolum contracta, apice breviter acuta, inferiora obtusiora 3:1.4 ad 6:1.5–1.8 cm., superiora 6:1 ad 8:1.8 vel 9.5:1.3 cm. magna, superne ut videtur obscure viridia, novella satis villosa-tomentella, dein costa vix prominula nervisque lateralibus planis exceptis subglabrescentia, subtus pruinosa, tomento densi griseo-flavescenti obtecta, costa nervisque lateralibus prominentibus in foliis adultis interdum partim glabrescentibus flavescens, rete nervillarum satis distincte subprominente, margine pl. m. distincte et satis irregulariter subcrenato-denticulata. Petioli 5–10 mm. longi, superne basi dilatata excepta convexi vel plani, omnino tomentelli. Stipulae minimae, deciduae, semi-ovato-lanceolatae, acutae, dense pilosae. Amenta tantum feminea visa, (ut videtur in autumnis) in axillis foliorum adultorum apparentia, sessilia, basi perula gemmarum dein decidua suffulta, elliptico-oblonga, florifera ad 1.5 cm. longa et 0.8 cm. crassa (frucifera majora?), densiflora, rhachi villosa; ovaria ovato-lanceolata, glabra vel sparse pilosa, in stylum distinctum apice breviter bifidum medio ovarii aequilongum producta, pedicello distincto ovario subaequilongo glabro vel sparse piloso suffulta, stigmatibus minimis stylo sub 4plo brevioribus breviter emarginatis; bractae obovato-oblongae, discolores, apice rotundatae, utrinque (saltem extus) pilis longis bracteam  $\frac{1}{2}$  plo superantibus praeditae; glandula 1, satis parva, ovato-oblonga, apice satis obtusa, pedicello 5–6plo brevior.

TYPE LOCALITY.—Mexico: “in convalli San Luis Potosi.”

RANGE.—Central Mexico: State of San Luis Potosi, probably also in Vera Cruz.

SPECIMENS EXAMINED.—Mexico: State of San Luis Potosi, "ex convalli S.L.P.," 1877, *J. G. Schaffner* (no. 265, f., type; N.).—State of Vera Cruz, "in montibus San Miguelito,"<sup>16</sup> 1876, *J. G. Schaffner* (no. 894, f.; G.).

From *S. Hartwegii* this species is easily distinguished by the characters given in the key. Unfortunately, I have seen only female specimens, according to which it seems to be most closely related to *S. lasiolepis*, of which I have seen a form of southern California with half-evergreen leaves, the aments appearing in the axils of the remaining leaves. But this species differs in the almost glabrous or much less pubescent leaves, in the longer cylindrical flowering aments, and in the longer gland which is two-fifths to one-half as long as the pedicel.

15. *S. LASIOLEPIS* Benth., Pl. Hartweg. 335. 1857.

TYPE LOCALITY.—California: "ad ripas fluviorum Salinas et Carmel prope Monterey" (coll. *Hartweg*, no. 1955).

RANGE (in Mexico).—States of Coahuila, Chihuahua, Lower California.

SPECIMENS EXAMINED.—Lower California: Nachoguero Valley, June 4, 1894, *L. Schoenfeldt* (no. 3426, fr.; W.); La Laguna, Sierra La Laguna, alt. 1650 m., January 27, 1906, *E. W. Nelson* and *E. A. Goldman* (no. 7462, m.; W.).—State of Chihuahua: Valley near Chihuahua, March 3, October 4, 1866, *C. G. Pringle* (no. 709, m., fr., st.; distributed as *S. irrorata* And.).—State of Coahuila, mountains near Saltillo, San Lorenzo Canyon, by brooks, alt. 2100 m., April 12, 1906, *C. G. Pringle* (no. 10210, fr., st.; G., M., W.; distributed as *S. Hartwegii* Benth.).

I refer these specimens to *S. lasiolepis* mostly on the authority of C. R. BALL, who determined the sheets of the Washington Herbarium. He has already made an extensive study of the species and forms of the sect. *CORDATAE*.

16. *S. Rowleei* Schn., nov. spec.—*S. cana* Rowlee in BOT. GAZ. 27:137. 1899, ut videtur pro parte, non Mart. and Gal.—Planta feminea (no. 13204 Pringlei, no. 680 Greggii): Frutex altus vel arbor ad 6 m. alta; ramuli novelli dense incano-villosuli, annotini floriferi nigro-fusci, paullo glabriores (tomento cano partim obtecti), subangulati, vetustiores pl. m. glabrescentes. Gemmae ut videtur ovato-oblongae, obtusae, tomentellae, bene evolutae

<sup>16</sup> There are two places of this name in Mexico according to Rand McNally's map, one in Jalisco, the other and apparently more prominent in Vera Cruz, about 55 km. west of the peak of Orizaba. HEMSLEY in Biol. Centr. Am. Bot. IV:134. 1887. states that "Wilhelm" Schaffner has sent plants to Dr. Gray "from the neighbourhood of San Luis Potosi" and that he collected also at Orizaba but not in Jalisco. This "Wilhelm" Schaffner is undoubtedly the same as "Dr. J. G. Schaffner" as printed on the labels before me.

ignotae. Folio (matura ignota) elliptica, vel minora ovalia et maxima elliptico-lanceolata, apice acuta, basi acuta vel obtuse cuneata, majora 4:2 ad 7.5:3 cm. magna, superne tantum valde initio subfloccoso-villosa, cito costa nervisque lateralibus (in parte versus costam) subtomentellis exceptis glabrescentia, viridia, subtus initio distinctius subflavescenti-villosa, cito glabrescentia, valde discoloria, albo-coerulea, pruinosa, costa flava pl. m. nervis nervillisque prominulis fere omnino glabris, margine integerrima vel distanter indistincte glanduloso-denticulata. Petioli cano-villosuli, 2-8 mm. longi. Stipulae visae minimae, semiovatae, denticulatae, vix 2 mm. longae. Amenta juvenilia (no. 680 Greggii) circ. ad 3:1 cm. magna, coetanea, pedunculo foliola 3-5 parva ceterum normalia gerente ad 1 cm. longo suffulta, fructifera (no. 13204 Pringlei) 5-8(-9) cm. longa (pedunculo excluso) et ad 1.5 cm. crassa, rhachi villosa. Ovaria ovoideo-conica, pedicello iis duplo brevioribus incluso glabra, stylo brevi sed distincto apice paullo bifido stigmatibus oblongis bifidis sublongiore coronata; bractee oblongae, obtusiusculae, pedicellum circ.  $\frac{1}{4}$  superantes, brunnescentes, utrinque satis laxè sericeo-lanatae; glandula 1, pedicello triplo brevior, rectangularis, apice truncata vel subbifida; fructus rostrati, pedicello 4plo brevioribus incluso ad 8 mm. longi, valvis apertis recurvatis.—Planta mascula (no. 8047 Pringlei): ramuli et folia juvenilia (semievoluta) ab iis plantae femineae vix diversa sed folia distinctius glaucescentia. Gemmae in ramulo sterili in herbario Grayi addito ovato-oblongae, ventre applanatae, apice subrostratae, dense subflavescenti-villosulo-tomentellae, subadpressae, ad 12 mm. longae. Amenta pl. m. praecocia, subsessilia, ad 4.5:1.5 cm. magna, pedunculo ad 8 mm. longo foliola parva minima ex parte squamiformia ut cetera pilosa et colorata gerente suffulta, densiflora, rhachi villosa; bractee oblongo-lanceolatae, apice obtusae vel subacutae, brunnescentes, utrinque laxè longe sericeo-lanatae, circ. 3 mm. longae; stamina 2, filamentis liberis glabris bracteis duplo longioribus, antheris flavis ovali-ellipticis circ. 1.5 mm. longis; glandula 1, ovato-rectangularis, apice truncata, bractea circ. 3plo brevior.—Folia adulta in herb. Grayi ad no. 8047 addita elliptica vel subovato-elliptica, apice acuta, basi subrotundata, ad 11.5:4 cm. magna, superne laete flavo-viridia,



fere omnino glabra, subtus glaucescentia, pruinosa, glabra sed ad costam nervosque elevatos partim ferrugineo-pilosa, rete nervillarum perspicue elevato, textura papyracea; petioli villosuli 7-10 mm. longi.

TYPE LOCALITY.—Mexico: Federal District, Eslava and mountains west of the City of Mexico (female) and Serrania de Ajusco (male).

RANGE.—As above.

SPECIMENS EXAMINED.—Mexico: Federal District, Eslava, thickets, alt. 2300 m., April 14, 1904, *C. G. Pringle* (no. 13204, f. type; W.; "15-20 ft."); mountain border west of the City of Mexico, April 26, 1849, *J. Gregg* (no. 680, f.; M.; "10 ft. high."); Serrania de Ajusco, alt. 2700 m., February 18, 1899, *C. G. Pringle* (no. 8047, m., paratype; G., M., W.; in Herb. N. mixed with fruiting *S. paradoxa*; in Herb. A. mixed with female var. ? *cana* and a sterile branch which may belong to the male plant).

I am not fully convinced that the female and male plants really belong to the same species. The male plant may be the same as the female form called by me var. ? *cana* below. Certainly, ROWLEE'S *S. cana* is not identical with the species of MARTENS and GALEOTTI. The description of these authors is rather incomplete, owing to the lack of fertile material, and I have not seen the type specimen. The statement "folia pollicaria," however, which probably refers to adult leaves, excludes a form like *S. Rowleei*, of which the leaves are much larger. Besides this the type of *S. cana* M. and G. has not been collected "in the same region" as the plant before us, the Peak of Orizaba being about 185 km. distant, as the crow flies, from the Cima de Ajusco. Furthermore, ROWLEE'S description does not apply exactly to all the specimens distributed under no. 6794 which ROWLEE cites as his type. The specimens in Herb. A., G., M., and W. consist only of female pieces which rather agree with the author's statement except (the base of the ovaries and) the pedicels being glabrous and not hairy. The male specimens which, I believe, belong to *S. Rowleei* are under *Pringle's* no. 8047 in Herb. G., M., and W.; while in Herb. N. the true male plant is mixed with a fruiting branch of *S. paradoxa* (see later), and in Herb. A. I find on the sheet of no. 8047 a male *S. Rowleei*, a female *S. Rowleei* var. ? *cana*, a sterile branch which may belong to *S. Rowleei*, and a branch in winter condition. ROWLEE apparently describes male flowers of *S. paradoxa* or its var. *ajuscana* because he states that the filaments are hairy, while those of no. 8047 before me are glabrous. The male plant of ROWLEE therefore does not belong to *S. Rowleei* m. As to his female plant, there also remains some doubt about its identity, and those forms with a hairy pedicel (and a hairy base of the ovary) may possibly be of hybrid origin and represent a cross between *S. paradoxa*, var. *ajuscana* and typical *S. Rowleei*. After all, this species and the following variety need further observation in the field.

16b. *S. ROWLEEI*, var. (?) **cana** Schn., nov. var.—*S. cana* Rowlee, l. c., quoad plant. fem. sensu stricto, non Martens and Galeotti.—Habitus ramulique ut in *S. Rowleei* vel *S. paradoxa*. Folia adulta nondum visa, semievoluta textura colore et pubescentia ab iis *S. Rowleei* vix diversa, sed juvenilia magis (ut in *S. paradoxa*) ferrugineo-pubescentia, dein valde glabrescentia. Amenta fructifera ad 7:1.8 cm. magna, pedunculo ad 1 cm. longo foliola pauca parva normalia gerente suffulta, iis *S. Rowleei* satis similia (juvenilia non satis evoluta in ramulo ad no. 8046 in Herb. A. addito ad eandem formam pertinere videntur); flores fructusque iis *S. Rowleei* potius quam iis *S. paradoxae* similia sed pedicello et basi ovarii pilosa diversa.

TYPE LOCALITY.—Mexico: Federal District, La Cima de Ajusco.

RANGE.—As above.

SPECIMENS EXAMINED.—Mexico: Federal District, La Cima de Ajusco, alt. 3100 m., April 16, 1898, *C. G. Pringle* (no. 6794, fr., type; A., G., M.); same locality, alt. 2700 m., February 18, 1899, *C. G. Pringle* (no. 8047 quoad ramul. florif. femin. in Herb. A.).

See the remarks under typical *S. Rowleei* and under *S. paradoxa*.

17. ***S. oxylepis*** Schn., nom. nov.—*S. latifolia* Mart. and Gal. in Bull. Acad. R. Brux. 10<sup>1</sup>:344 (Enum. Pl. Gal. Mex. 4). 1843, non Forbes 1828; Hemsley in Biol. Centr. Am. Bot. 3:180. 1883.—Habitus?; ramuli novelli annotinique floriferi dense griseo-vel subflavescenti-villosuli vel villosito-tomentelli, subangulati (in no. 230 ramuli floriferi fusci satis glabrescentes), dein cinereo-fusci, glabrescentes. Gemmae bene evolutae non visae, puberulae. Folia tantum juvenilia visa, ovato-elliptica, vel obovato-oblonga, basi cuneata, apice breviter acuta (vel in no. 230 obtusiora), ad 4.5:1.5 cm. magna (in no. 230 ad 3:1.5 cm.), superne viridia, initio pl. m. laxe pubescentia, cito costa villosula excepta glabra, subtus discoloria, initio satis dense griseo-vel fulvo-villosa, dein glabrescentia, glaucescentia, pruinosa, costa nervisque prominentibus flavescentibus, rete nervillarum nondum distincte evoluta, margine subdenticulata (in no. 230 integerrima). Petioli pilosi, ad 4 mm. longi. Stipulae ut videtur minimae, caducae. Amenta subpraecocia vel coetanea, tantum mascula visa, cylindrica, ad 4.5:1.2 cm. magna (antheris delapsis tenuiora), sessilia vel pedunculo foliola parva

pauca ut normalia villosa gerente ad 1 cm. longo suffulta, rhachi villosa. Bracteae elliptico-lanceolatae, acutae (vel in no. 230 anguste ovato-lanceolatae, subacuminatae), discolores, utrinque longe sericeae, ad 3 mm. longae; stamina 2, filamentis liberis vel ad basim  $\frac{1}{6}$  coalitis circ.  $\frac{1}{3}$  pilosis dein bracteam circ.  $2\frac{1}{2}$ plo superantibus valde elongatis, antheris flavis ellipticis; glandula 1, satis crasse et late rectangularis vel late ovato-rectangularis, apice truncata vel subemarginata, bractea circ. 3plo brevior.

TYPE LOCALITY.—Mexico: State of Puebla (or Vera Cruz) "sur les flancs du pic d'Orizaba, à 12000 pieds" [3700 m.] (coll. *Galeotti*, no. 70, ex Mart. and Gal.).

RANGE.—Central Mexico, on and near the Peak of Orizaba.

SPECIMENS EXAMINED.—Mexico: State of Puebla, Mt. Orizaba, alt. 2900–3200 m., March 18, 1894, *E. W. Nelson* (no. 272, m., type of *S. oxylepis* in Herb. W.); Boca del Monte [according to Rand MacNally's map 17 miles east of Esperanza], March 13, 1894, *E. W. Nelson* (no. 230, m.; W.).

*S. latifolia* Mart. and Gal. is a very little known species, of which the authors give a rather incomplete description of the male plant. Not having seen the type, I am not sure whether these specimens really belong to this species, but regarding the statement "squamis lineari-subulatis elongatis" and the fact that the type had been collected on the same mountain range, I believe that *Nelson's* plant may be identical with that of *Galeotti*. The name *latifolia* has to be changed on account of the earlier *latifolia* Forbes, which is a valid name. Owing to the incomplete material, it is impossible to decide whether *S. oxylepis* is a good species or perhaps only a variety of *S. paradoxa* Kth. s. l., to which those specimens belong that have been distributed as *S. latifolia* by PRINGLE. *Nelson's* specimens were named *S. lasiolepis*, var. *Bigelovi* by BEBB, but so far as I know this variety is entirely absent from Mexico.

18. *S. PARADOXA* Kunth in Humb. and Bonpl., Nov. Gen. Pl. 2:20. 1817; Syn. Pl. Aequin. 1:366. 1822; And. in DC. Prodr. 16<sup>2</sup>:226. 1868, in textu sub *S. discolore*; Hemsl. in Biol. Centr. Am. Bot. 3:180. 1883.—Ad descriptionem auctoris incompletam addenda et emendanda: Arbor humilis densa, ad 6.5 m. alta; ramuli novelli ferrugineo-villosuli, pilis griseis intermixtis, hornotini paullo glabriores, annotini (floriferi) pl. m. tomentelli vel satis glabrescentes, atro-fusci, angulati. Gemmae (in no. 5698) ovato-oblongae, ventre planae, apice subrostratae, subadpressae, brunneae, paullo (saltem ad apicem) pilosae, ad 1 cm. longae. Folia (tantum in no. 5698 submatura) papyracea, oblongo-elliptica vel elliptico-

lanceolata, basi pleraque breviter cuneata, rarius subrotundata, apice acuta, minora inferiora (minimis basi ramulorum exceptis) 5:2 ad 8:2.5 cm. magna, majora superiora ad 13:3.5 cm. (vel ad 10:3.8 cm. in no. 1800 Purpusii) magna, superne tantum novella tomento ferrugineo cito evanescente obtecta, dein costa ferrugineo-tomentosa excepta fere glabra, viridia, subnitidula, nervis laterali-bus distincte flavescen-tibus, etiam rete nervillarum subvisibili, subtus initio densius ferrugineo- vel subgriseo-tomentoso-villosula, cito costa nervisque prominentibus exceptis fere glabra, valde glaucescentia, pruinosa, reticulata, margine integerrima vel saltem versus apicem irregulariter et saepe indistincte glanduloso-sub-serrata. Petioli 3-13 mm. longi, superne subsulacti, undique ferrugineo-tomentelli. Stipulae cito deciduae, semiovatae vel semi-lanceolatae, parvae, ad 4 mm. longae, glanduloso-denticulatae, laxe piloase. Amenta praecocia vel subcoetanea, feminea tantum visa, crasse cylindrica, pedunculo brevi ad 1 cm. longo foliola parva lanceolata ut normalia pilosa gerente suffulta, florifera (in no. 1800) ad 6.5 cm. longa et 12 mm. crassa, divaricata, curvata, rhachi villosa; ovaria ovoideo-oblonga, pedicello iis circ.  $\frac{2}{3}$  brevioribus incluso pl. m. dense villosa, stylo pedicello circ.  $\frac{1}{3}$  brevioribus apice bifido coronata, stigmatibus oblongis angustis stylo subaequilongis vel sublongioribus bifidis; bractee oblongae vel obovato-oblongae, obtusae, discolores, utrinque pl. m. longe albo-sericeo-lanatae, pedicello circ.  $\frac{1}{3}$  longiores; glandula 1, ovato-rectangularis, apice truncata, pedicello subduplo vel subtriplo brevior; fructus ovoideo-lanceolati, subrostrati, pedicello circ.  $\frac{3}{4}$  brevioribus incluso 8-9 mm. longi, ut ovaria vel minus dense villosi, valvis apertis satis recurvatis.

TYPE LOCALITY.—Mexico: State of Hidalgo, "prope Moran Mexicanorum, alt. 1330 hex." (coll. *Humboldt* and *Bonpland*, ex Kunth).

RANGE.—Central Mexico: probably from southern Hidalgo through Mexico, Federal District to Oaxaca.

SPECIMENS EXAMINED.—Mexico: State of Mexico, Ixtaccihuatl, alt. 2700-3200 m., December 1905, *C. A. Purpus* (no. 1800, f., fr.; G., M., N.).—Federal district, La Cima de Ajusco, April 18, 1900, *W. Trelease* (no. 135, fr.; M.; according to the large fruiting aments, the distinct styles, and the partly ferruginous pubescence typical *paradoxa*).—State of Oaxaca, Sierra de San Felice, by springs, alt. 3200 m., May 18, 1906, *C. G. Pringle* (no. 10185, fr.;

“15–20 ft.”); same locality, September 26, 1894, *C. G. Pringle* (no. 5698, st.; G.; leaves identical with those of the preceding no. in Herb. M.).

ANDERSSON says that he has seen of *S. paradoxa* nothing but “*pauca specimina tantum eaque deformata.*” His statement “*capsulae hirsutae longe pedicellatae, stylo nullo*” does not apply to what I take for the typical *paradoxa*. KUNTH does not mention a style; he describes abnormal (androgynous) female aments, and according to his statement “*amenta . . . fructifera subtripollicaria, crassitie pollicis.*” I regard as *paradoxa* the plant with the very large fruiting catkins. This form has a distinct style which is very short (mostly hidden among the hairs of the apex of the ovary) in var. *ajuscana*, but this variety does not have “*folia . . . subtus nervo et venis primariis prominentibus ferrugineo-tomentosis*” as KUNTH says, and the fruiting aments measure only up to 5:1.2 cm.

ROWLEE, in describing *S. Pringlei*, apparently mixed typical forms of *paradoxa* with those of var. *ajuscana*. Furthermore, he seems to have had before him another form with glabrous pedicels (see BOT. GAZ. 27:137, fig. 1, a–b). I have not yet seen a specimen fully agreeing with ROWLEE’S description and figure, therefore I regard the true *S. Pringlei* as an obscure form not identical with *Pringle’s* no. 6795 of the different herbaria I have seen. *S. Pringlei* may belong to a hybrid between *S. Rowleei* and *S. paradoxa* var. *ajuscana*, which both occur on the Cima de Ajusco.

18b. *S. PARADOXA*, var. **ajuscana** Schn., var. nov.—*S. Pringlei* Rowlee in BOT. GAZ. 27:136. 1899, pro parte.—Frutex 0.5 ad 1.5 m. altus; ramuli novelli griseo-villosi, annotini floriferi fusco-vel olivaceo-brunnei, subangulati, parce (vel partim) villosuli vel subglabri, lenticellosi; gemmae bene evolutae nondum visae. Folia tantum semievoluta visa, elliptico-ovalia vel elliptica, apice acuta, interdum subplicata, base acuta vel subobtuse cuneata (vel minora subrotunda), majora 4–6.5:2–2.8 cm. magna (matura probabiliter satis majora), superne initio albo-pubescenti-villosa, dein viridia, costa nervisque lateralibus pl. m. exceptis glabrescentia (saltem in no. 13205), subtus dense albo-pubescenti-tomentosa, costa nervisque flavescens prominentibus, rete nervillarum sub pube occulto, glaucescentia, pruinosa, margine integerrima vel ad apicem obscure glanduloso-denticulata. Petioli ad 5 mm. longi, omnino villosuli; stipulae parvae semiovatae, denticulatae, villosulae, ad 3 mm. longae, caducae. Amenta praecocia, subsessilia, basi foliolis parvis squamuliformibus paucis subtus dense sericeis suffulta, rhachi villosa; mascula (in no. 6795) elliptico-cylindrica, ad 4 cm. longa et circ. 12–15 mm. crassa, vix curvata et divaricata; bractee

discolores, anguste obovato-oblongae, apice rotundatae (interdum leviter eroso-denticulatae), utrinque longe lanato-pilosae; stamina 2, filamentis liberis dein bracteis subduplo longioribus basi  $\frac{1}{3}$  villosis, antheris flavis ovoideis; glandula 1, elliptico-rectangularis, bractea 2-2 $\frac{1}{2}$ plo brevior, interdum satis lata. Amenta feminea florifera cylindrica 3-4:1 cm. magna, fructifera 4-5:1.5-1.7 cm. magna; ovaria ovoideo-oblonga, adultiora circ. 4 mm. longa et pedicello iis subduplo brevior suffulta (in floribus juvenilibus pedicellus quam glandula vix longior); stylus subnullus vel brevis, stigmatibus oblongis bifidis duplo brevior (vel in fructu stigmatibus subaequilungus). Fructus pedicello 3-4plo brevior incluso ad 7 mm. longi, dense villosi.

TYPE LOCALITY.—Central Mexico: Federal district, La Cima de Ajusco.

RANGE.—As above.

SPECIMENS EXAMINED.—Mexico: Federal District, La Cima de Ajusco, alt. 3200 m., April 16, May 21, 1898, C. G. Pringle (no. 6795, m., f., fr., type; G., M., W.; "2-5 ft."); same locality, April 16, 1904, C. G. Pringle (no. 13205, m., f., st.; G., W.; "2-3 ft."; M.; "dwarf"; forma ut videtur valde ad *S. paradoxam typicam* spectans).

ROWLEE cites Pringle's no. 6795 as type of his *S. Pringlei* and says "no staminate plant was collected," but the specimens before me consist of male and female material. Furthermore, ROWLEE states that the pubescence of the leaves is "slightly ferruginous" and that the leaves are "at maturity becoming nearly glabrous." As I have already pointed out, ROWLEE'S description does not fit exactly the material distributed under no. 6795, and I think it best not to use the name *Pringlei* for the variety because there may be hybrid forms. ROWLEE apparently overlooked the original description of *paradoxa*. He says that his species "is related to *S. candida*" which, in my opinion, has nothing whatever to do with the Mexican plant.

The var. *ajuscana* differs chiefly from *S. paradoxa* by its almost entirely grayish pubescence, the more elliptic or elliptic-ovate shape of the leaves, the shorter style of the ovaries, and the smaller size of the fruiting aments.

19. *S. CANA* Martens and Galeotti in Bull. Acad. Roy. Brux. 10<sup>t</sup>:344 (Enum. Pl. Gal. Mex. 4). 1843; Hemsley in Biol. Centr. Am. Bot. III:179. 1883.—Ramuli annotini tomento brevi denso cano vestiti, pl. m. angulati, dein subglabrescentes, atro-brunnei vel atro-purpurei; gemmae bene evolutae non visae. Folia adulta ignota, juvenilia anguste oblanceolata, basi subacuta, apice distinctius acuta et tenuiter mucronulata, 9:2 ad 18:4 mm. magna,

integerrima, superne viridia, ?nitidula, initio laxe sericeo-villosa, dein costa excepta glabrescentia, subtus discoloria, initio distincte partim brunnescenti-sericeo-villosa, dein ut videtur satis glabrescentia (et ? glaucescentia). Petioli brevissimi, ad 2 mm. longi, pilosuli. Stipulae non visae. Amenta mascula coetanea, minima, ovata, densiflora, ad 8:6 mm. magna, basi foliis iis longioribus obsita, rhachi villosula; bractee obovato-oblongae, brunnescentes, apice rotundatae, utrinque satis laxe crispato-pubescentes; stamina 2, filamentis liberis bracteam ad 2plo superantibus basi  $\frac{1}{3}$  villosulis, antheris flavis parvis elliptico-globosis; glandula 1, ovato-rectangularis, apice truncata, circ.  $1\frac{1}{4}$  bractee aequans.

TYPE LOCALITY.—Central Mexico: "habite les ravines humides du pic d'Orizaba, à environ 11 ou 12000 pieds d'élévation absolue" [3400-3700 m.] (coll. *H. Galeotti*, no. 69, ex. Mart. and Gal.).

RANGE.—Uncertain.

SPECIMENS EXAMINED.—Mexico: without exact locality, "Penas carg. April 1839," *C. Ehrenberg* (no. 1280, m.; W., ex Mus. Bot. Berol.).

The description of *cana* by the authors is very short and is based on sterile material only, and I have not yet been able to compare type material. It runs: "Canescenti-glauca; ramulis cinereo-subtomentosis, foliis subsessilibus oblongis integerrimis acutiusculis glabris subtus glaucis.—Amenta ignota, stipulae non visae, folia pollicaria.—Affinis *Salici paradoxa* H.B.K." By ROWLEE *Pringle's* no. 6794 had been regarded as *S. cana* M. and G., but, as I have explained under *S. Rowleii*, the plant from the Cima de Ajusco does not agree with the description of *S. cana*. This species of which the authors had apparently before them adult sterile specimens has "folia pollicaria." Considering the younger state, *Ehrenberg's* plant agrees well with the statements of MARTENS and GALEOTTI. Nevertheless, I am not yet sure about the identity of the two plants, especially as we do not know the exact habitat of *Ehrenberg's* plant. It has been referred to *S. cana* by such an eminent salicologist as V. SEEMEN according to the handwriting on the sheet.

There remains one more species described from Mexico:<sup>17</sup> *S. Endlichii* v. Seemen in Fedde, Rep. Spec. Nov. 5:19. 1908. The type was collected by *R. Endlich* in the state of Chihuahua, "in

<sup>17</sup> There is also a *S. cinerea* Sesse and Mocino, Fl. Mex. ed. 2. 229. 1894, excl. syn., non L., described as "*Salix* foliis oblongis, denticulatis, subtus villosis-cinereis, stipulis semicordatis. F.M. Habitat in montibus umbrosis S. Angeli et plurimis Hisp. locis." There are 3 different localities bearing the name San Angel in Mexico. The description is much too incomplete to make even a guess at the identity of this obscure species.

den Thälern der westlichen Sierra Madre, 2250–2450 m. hoch," April 16–17, 1906 (no. 1225a, 1226). I have not seen any form from this state which agrees with v. SEEMEN'S description, and unfortunately I have not been able to compare the type. Judging by the ample description, it seems to me that this species must be very similar to *S. cana* sensu meo. The narrow lanceolate leaves measure up to 1.6 cm. in length and 0.3 cm. in width; the aments are described as "coetanea, sessilia, basi foliis parvis obsita, parva, subglobosa, usque 0.7 cm. longa et lata"; and the fruits are "stipata (stipite capsulae dimidium aequante, dense incano-pubescente), e basi ovali conica, dense incano-pubescentia, stylus brevissimus, stigmata brevia emarginata capitellata; glandula 1 posterior, ovalis, truncata, capsulae stipitis dimidium aequans." After all, *S. Endlichii* may be a rather glabrescent form of *S. cana* or a closely allied species.

There are several Mexican specimens left which I believe may be regarded as of hybrid origin, or partly even as new species. At the present time I can only enumerate them, adding a few remarks. We need a much better understanding of the Mexican willows and more copious material of the forms in question before we can obtain a correct opinion of them.

(?) 1b × 6. *S. HUMBOLDTIANA*, var. *STIPULACEA* × *S. BONPLANDIANA*.—State of Oaxaca, valle de Etla, alt. 1580 m., April 1906, *C. Conzatti* (no. 1722, fr.; W.).

It differs from the first in the smaller, more narrowly lanceolate subconcolorous leaves, which measure up to 10 by 1.2 cm. and possess numerous stomata in the upper epidermis. The branchlets are finely puberulent and dull reddish brown; the dense curved fruiting aments borne on short leafy peduncles (1 cm.) measure about 4 by 1 cm. The influence of *S. Bonplandiana* may be seen in the comparatively broader and firmer leaves with a pale under surface, and in the stouter aments. Possibly, however, it may be nothing but a form of var. *stipulacea*.

(?) 3 × 6. *S. GOODDINGII* × *S. BONPLANDIANA* (vel spec. nov. ?).—Southern Lower California: La Paz, January 20 to February 5, 1890, *E. Palmer* (no. 77, m.; W.); same locality, June 14, 1897, *J. N. Rose* (no. 1308, m.; W.).

The first specimen is named *S. Bonplandiana* var. *pallida*, the second *S. Bonplandiana*, but both do not represent the type or a form of this species



on account of the presence of stomata in the upper epidermis of the leaves. They look to me like hybrids between this species and *S. Gooddingii*, but I do not know whether the last species ever has been found so far south in Lower California. Instead of it one of the parents with stomata in the upper surface of the leaves may be *S. nigra* var. *Lindheimerii* (or even *S. Humboldtiana stipulacea*). The male flowers are very similar to those of *S. Bonplandiana*, the young branchlets and leaves are more or less pubescent (in no. 77 laxe subhirsuto-villosa), and the under surface of the (not yet mature) leaves is but slightly glaucous. Owing to the lack of female material, it is impossible to judge the form more correctly.

SALIX (?), spec. nov.—Territorio de Tepic, in the Sierra Madre, near Santa Teresa, August 11, 1897, *J. N. Rose* (st.; W.). These sterile branchlets seem to belong to a new species related to *S. Schaffnerii*, and may be described as follows: Ramuli hornotini apice pubescentia villosula griseo-brunnea vestiti, citissime glabrescentes et basim versus intense purpurascens, glabri. Folia matura chartacea, anguste lanceolata, utrinque acuta vel apice subacuminata, minima 3:0.6 cm., maxima ad 9:1.2 cm. magna, dense glanduloso-subserrato-denticulata, superne initio sparse puberula, cito glabra, intense viridia, costa nervisque subflavescentibus, subtus albescentia, pruinosa, initio densius pilosa, dein fere glabra, costa nervisque elevatis et reticulata. Petioli vix 5 mm. longi, superne sulcati et pilosuli.

ARNOLD ARBORETUM